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AIR POLLUTION ABSTRACTS

38847-40153

SEPTEMBER 1974

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

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AIR POLLUTION ABSTRACTS

VOLUME 5, NO. 9 SEPTEMBER 1974

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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CONTENTS

Introduction 3
APTIC Publications 5
Recent Contract Awards 6
Subject Fields and Scope Notes 9
Abstract Bulletin 11
Subject Index SI-1

The terms that most closely describe the information presented in the documents are arranged alphabetically.

Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

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Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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Northrop Services, Inc., Post Office Box 1484, Huntsville, Alabama 35807 (NOTE: Contract contains options in the amount of $254,620)

Contract No. CPA-70-161, Modification No. 7 .... *$106,788*
FIELD LABOR ESCALATION REQUIREMENTS OF THE CAT-OX DEMONSTRATION.
Illinois Power Company, 500 South 27th Street, Decatur, Illinois 62625

Contract No. 68-02-1718, RFP No. Du-74-B418 .... *$53,180*
RESEARCH SOURCES SOUGHT FOR CONDUCTING SMOG CHAMBER STUDIES OF AEROSOL FORMATION.
Battelle Memorial Institute, Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-1452, RFP No. Du-74-A146 .... *$186,933*
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Foster Associates, Inc., 1101 17th Street, N. W., Washington, D. C. 20036 (NOTE: Contract contains options in the amount of $322,015)

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AN EVALUATION AND INTERCOMPARATIVE STUDY OF WET CHEMICAL AND INSTRUMENTAL METHODS FOR SULFATE DETERMINATION OF ATMOSPHERIC AEROSOLS.
State of California, Department of Health, 2151 Berkeley Way, Berkeley, California 94704

Contract No. 68-02-1732, RFP No. Du-74-B535 .... *$99,993*
EVALUATE THE INFLUENCE OF INHALATION OF ACID AEROSOLS, H3SO4, SO3, HNO3 AND PARTICLES ON PRODUCTION OF CHRONIC LUNG DISEASE IN RATS AND PRIMATES.
Regents of the University of California, University of California, Davis, California 95616 (NOTE: Contract contains options in the amount of $149,915)

Contract No.0008068-02-1200, RFP No. Du-74-B411 ....*$271,500*
STUDY OF THE USE OF LEUCOCYTES METABOLISM AS A HEALTH EFFECT INDICATOR.
Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025

Contract No. 68-02-1740, RFP No. Du-74-B506 .... *$78,000*

GUIDELINES FOR QUALITY ASSURANCE PROGRAMS FOR AIR MEASUREMENT SYSTEMS.

Olson Laboratories, Inc., 425 East Cerritos Avenue, Anaheim, California 92805

Contract No. 68-02-1453, RFP No. Du-74-A052 .... *$123,467*

APPLICATION OF FOAM SCRUBBING TO FINE PARTICLE CONTROL.

Monsanto Research Corporation, Dayton Laboratory, 1515 Nicholas Road, Dayton, Ohio 45407

Contract No. 68-02-1382, Task Order No. 5 .... *$50,000*

INSTALLATION OF ENFORCEMENT MANAGEMENT SYSTEM IN SOUTH CAROLINA AND TENNESSEE.

The Research Corporation of New England, 125 Silas Deane Highway, Wethersfield, Connecticut 06109

Contract No. 68-02-1752, RFP No. Du-74-B542 .... *$16,760*

STUDY OF PROTOTYPE LASER-DOPPLER VELOCIMETRY INSTRUMENTATION FOR REMOTE MEASUREMENT OF POWER PLANT STACK EFFLUENT EXIT VELOCITY.

Raytheon Company, 528 Boston Post Road, Sudbury, Massachusetts 01776

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RELATIONSHIP BETWEEN THE INCIDENCE OF CONGENITAL ANOMALIES AND THE USE OF RADAR AT MILITARY BASES.

Southern Research Institute, 2000 Ninth Avenue South, Birmingham, Alabama 35205

Contract No. 68-02-1567, Modification No. 2 .... *$174,807*

TECHNICAL SERVICES FOR OPERATION AND MAINTENANCE OF WIND TUNNEL RESEARCH FACILITIES.

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INHALATION TOXICOLOGY OF PESTICIDES DESIGNATED 'SUBSTITUTE CHEMICALS'.

Stanford Research Institute, Menlo Park, California 94025

Contract No. 68-02-1229, Modification No. 3 .... *$34,662*

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Philco-Ford Corporation, Aeronutronic Division, Ford Road, Newport Beach, California 92663

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SERIAL MEASUREMENT OF PULMONARY FUNCTIONS IN PANELS OF ASTHMATICS AND OCCUPATIONAL GROUPS IN THE ST. LOUIS METROPOLITAN AREA.

St. Louis University, School of Medicine, 1402 South Grand Boulevard, St. Louis, Missouri 63104

Contract No. 68-02-1386, Task Order No. 10 .... *$35,000*
PROVIDE TECHNICAL ASSISTANCE TO EPA REGIONAL OFFICE PERSONNEL AND SELECTED STATE AGENCIES IN THE DEVELOPMENT OF AIR QUALITY MAINTENANCE PLANS.

Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1496, RFP No. Du-74-A154 .... *$63,521*
EVALUATION OF NOVEL DEVICES.

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Contract No. 68-02-1487, RFP No. Du-74-A153 .... *$63,167*
EVALUATION OF NOVEL DEVICES.

GCA Corporation, Burlington Road, Bedford, Massachusetts 01730 (NOTE: Contract contains options in the amount of $66,123)

Contract No. 68-02-1816, RFP No. Du-74-A125 .... *$774,560*
CONTRACTOR OPERATION OF EPA OWNED SO2 PILOT SCRUBBER, AERODYNAMIC TEST CHAMBER, MOBILE FABRIC FILTER, WET SCRUBBER, ELECTROSTATIC PRECIPITATOR AND CYCLONE UNITS LOCATED OR HOME BASED AT RESEARCH TRIANGLE PARK, NORTH CAROLINA.

Monsanto Research Laboratory, Dayton Laboratory, 1515 Nicholas Road, Dayton, Ohio 45407 (NOTE: Contract contains options in the amount of $506,565)

Contract No. 68-02-1488, RFP No. Du-74-A278 .... *$975,698*
DESIGN AND SCALE-UP CRITERIA OF LOW EMISSION, HIGH EFFICIENCY BURNERS APPLICABLE TO INDUSTRIAL AND UTILITY BOILERS.

Ultrasystems, Inc., 500 Newport Center Drive, Newport Beach, California 92660

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to n industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

38847 **APTIC NO. 62382**

Amano, Masuo

THE EFFECTS OF VARIOUS ENGINE PARTS ON EXHAUST GAS. *(Haiki gasu ni oyobosu enjin kakubu no eikyo). Text in Japanese. Preprint, Japan Automobile Technical Assoc., Tokyo, p. 277-283, Tokyo. (Presented at the Japan Automobile Technical Association, Lecture Meeting, Tokyo, Japan, May 1974, Paper 38.)*

Changes in the composition, nature, and amount of engine exhaust gases depending on the condition of various parts of engines are discussed. Emissions of carbon monoxide are largely determined by the air-fuel ratio, nitrogen oxides are determined by combustion temperature and speed, but hydrocarbons are often very difficult to determine. The effects of air-fuel ratio, ignition plug gap, spark timing, compression ratio, the shape of combustion chamber, manifold heating methods, exhaust manifold capacity and temperature, valve timing, and valve overlap, on exhaust emissions are discussed. Other controlling factors are temperature of suction air, distribution of mixed air, material quality of cylinder head and block, the position of ignition plus, and the friction power of various parts of engine.

38848 **APTIC NO. 61800**

Beising, R. and H. Kirsch

THE BEHAVIOR OF THE TRACE ELEMENT FLUORINE FROM FOSSIL FUELS AT THE COMBUSTION. *(Das Verhalten des Spurenelementes Fluor aus fossilen Brennstoffen bei der Verbrennung). Text in German. VGB Kraftwerkstechnik, 54(4):268-286, April 1974. 61 refs.*

Fluorine is in coal largely bound to the mineral fraction. In the Ruhr coal, the fluorine concentration amounts to between 15 and 210 ppm, soft coal from the lower Rhine contains only 3 to 28 ppm fluorine. Solubility experiments with coal showed a mobility of the F-ions in the water-containing coals. Only a small fraction of the fluorine in the coal stems from the original plant material, the main fraction is found in the illites. In the cyclone melting furnace fired by hard coal which was examined, the fluorine evaporates entirely from the liquid slag. The fluorine concentration in the fly ash collected in the dust collectors may reach as much as 1100 ppm. In soft coal-fired furnaces with dry ash tap-off, about one fourth of the fluorine is retained in the fly ash in the electrostatic precipitator. The largest local fluorine concentration (2200 ppm) was found in the thin deposits on the combustion chamber walls. In the examined furnaces, with the exception of the soft coal fired boilers, the fluorine concentration in the ash increases with decreasing flue gas temperature from zero to 2700 ppm. At a flue gas temperature above 900 C, no fluorine is bound in the deposits. The fluorine ions in the fly ash from soft coal- and hard coal-fired boilers showed a relatively low water solubility. In the literature it is generally assumed that from power plants, the fluorine escapes largely in gaseous form as hydrogen fluoride and silicon fluoride. The formation of HF is promoted by the high water concentration of the flue gases. The present examinations revealed that fluorine is largely bound to the octahedron layer of the clay mineral as a replacement of hydroxyl ions. Under the conditions of the combustion chamber they leave the disintegrating structure and form HF.

38849 **APTIC NO. 62695**

Bryan, Robert J.

POINT SOURCE EMISSION INVENTORY FOR LOS ANGELES COUNTY (FINAL REPORT). *Pacific Environmental Services, Inc., Santa Monica, Calif., Environmental Protection Agency Contract 68-02-1004, Task 2, Program Element 2A4136, Rept. EPA-450/3-74-018, 32p., Feb. 1974.*

NTIS: PB 231699/AS

Results are reported for an emissions inventory of the county of Los Angeles. Emissions of air pollutants from point sources which discharge to the atmosphere more than 100 tons/year of either particulate matter, sulfur dioxide, hydrocarbons, carbon monoxide, or nitrogen oxides are surveyed and assembled in a format suitable for use in completing the National Emissions Data Systems forms which are encoded and submitted in computer readout form. The sources have been broken down to industrial, power plant, commercial, and residential categories. The values for total emissions in tons/yr are: particulates, 9049, SO2, 100, 708, NOx, 66, 542, HC, 48, 175, and CO, 864. (Author abstract modified)

38850 **APTIC NO. 61802**

Fock, Martin, Karl-Heinz Lies, and Heinrich Schlumbohm

DETERMINATION OF THE PARTICULATE EMISSION OF OTTO ENGINES. *(Zur Bestimmung der Feststoffemission von Ottomotoren). Text in German. Motortech. Z. (Duesseldorf), 35(3):91-94, 1974. 1 ref.*

The emissions of Otto engines of soot, lead compounds, rust, nonvolatile hydrocarbons, and oil mists were determined by installation of a glass fiber filter between constant volume sampler and exhaust exit. With a pump, a gas flow of 5 l/min was drawn from the constant volume sampler for continuous particulate measurements and passed through a scrubber of 0 C. The solid matter was then separated by the glass fiber filter. The filter was irradiated with beta rays. The absorption of the radiation intensity was measured in two ionizing chambers. For absolute measurements the entire waste gas flow was passed over the glass fiber filter, and the collected particulate quantity was gravimetrically measured. With both methods, the dependence of the particulate emission on various driving conditions such ass cruising, acceleration, and warm and cold start was determined. The Europe and U. S. 72 test were run with the engine to determine the particulate emission in these tests, and the influence of the lead concentration in the fuel on the particulate emission was investigated. The results show that the load of the engine has great influence on the particulate emission. During acceleration, the engine emitted, on the average, six times the amount of particulates it emitted during cruising, and that independently of the fuel consumption. The particulate emission during the Europe and US-72 test was between the concentrations measured during cruising and during acceleration (each time with cold start). Compared to warm start, the particulate emission at cold start is on the average twice as high both for acceleration and cruising. In the US-72 test, 48% of the particulates emitted during the entire test were emitted within the first 5.5 min until the oil temperature reached 60 C. While the particulate emission during cruising (with both warm and cold start) increased only slightly with increasing lead concentration, the linear increase with the lead concentration was unexpectedly high during acceleration.

38851 **APTIC NO. 62295**

Foster, J. F., D. M. Jenkins, H. S. Rosenberg, and J. H. Oxley

SULFUR MARKETS FOR OHIO UTILITIES. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Office of Air and Water Programs Contract 68-02-0040, Task II, Environmental Protection Agency- 450/3-74-026, 93p., March 1974.*

NTIS: PB 232 010/AS

Sulfur emissions from Ohio utilities are described in a market study of sulfur by-products. The 27 coal-burning steam electric plants selected as the study sample of important plants in Ohio has 92.5% of Ohio's total generating capacity in 1970, and consumed 97% of the coal burned for electric power generation. Sulfur dioxide emissions from these plants were estimated at 2.4 million tons in 1971. Projected uncontrolled emissions of SO2 for this group in 1975 will be 3.4 million tons. The possible by-products include S, sulfuric acid made from recovered SO2, pure liquefied SO2, calcium sulfate (gypsum), sodium sulfite, and ammonium sulfate. Up to 12% of the S expected to be emitted from Ohio utilities in 1975 can be sold in local markets. This S would be sold in the form of elemental S, H2SO4, and gypsum. If a phosphate fertilizer industry were established in Ohio, a new market for sulfuric acid equivalent to about 7% of uncontrolled 1975 emissions woudl be generated. (Author summary modified)

38852 **APTIC NO. 62167**

Fujii, Masami

POLLUTANTS IN AIRCRAFT EXHAUST GAS AND AIR POLLUTION--SCIENCE AND OBSERVATION. *(Kokuki haigasuchu no osenbusshitsu to taiki osen - sono kagaku to kosatsu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 28:3-28, Feb. 1974.*

The investigation of air pollution by jet aircraft exhaust gas conducted at the Tokyo and Osaka International Airports between the fall of 1970 and the fall of 1971 is comprehensively reviewed. The types of engines, operation modes, main pollutants in jet engine exhausts, the total emission quantity and pollutant concentration, emission quality and quantity per second, the relationships among engine modes, fuel consumption, and pollutants, individual pollutants, and comparisons of airplane/automobile emissions and airplane/fixed source emissions are discussed. Both airports are located in other polluted areas and the precise pollution factors and contribution by jet engine emissions were difficult to determine. The clearly confirmable contribution varied between 0.005-0.01 ppm. The landing and departing of an airplane is one per runway, and even during the most congested traffic, emission time intervals are much greater than for automobiles and fixed sources. The total emission per day at the Tokyo International Airport equals, in carbon monoxide quantity, 710 automobiles (1600 cc engine), in hydrocarbons, 2625 automobiles, and in nitrogen oxides, 2852 automobiles. However, a jet engine emits a large quantity of exhaust gas with relatively low concentration of pollutants, and the dispersion rate is extremely high. All these factors make it difficult to really evaluate the pollution contribution ratio of jet engines. However, with the increase of large aircraft, the problem of pollution by jet engines will only increase. Considering the fact that the major part of CO and HC emission by a jet engine during its ground activity is contributed by the 15-min idling of engine, shortening the idling time will contribute much to abatement of total emission.

38853 **APTIC NO. 62354**

Fujii Minoru

ON DIVERSIFICATION OF FUEL AND THERMAL POWER FACILITIES. *(Nenryo no tayoka to karyoku setsubi ni tsuite). Text in Japanese. Preprint, Japan Society of Thermal Power Engineers, Tokyo, p. 21- 34, 1974. (Presented at the Japan Society of Thermal Power Engineers Training Conference on Fuel, Tokyo, Japan, March 29, 1974, Paper 3.)*

Spurred by the recent energy crisis, fuel diversification research will be accelerated in an effort to solve the problem. Boilers for thermal power generation which will be designed according to properties of a fuel they will use are discussed. Properties of such liquid fuels as heavy oil, crude oil, light-quality naphtha, heavy-quality naphtha, and methanol, as well as compositions of their combustion gases, are tabulated. Gas fuels including liquefied natural gas (LNG), blast furnace gas (BFG), and a few other gasified fuels are also are described, and their properties and compositions of their combustion gases are shown. Revival of coal as a fuel for thermal power plants is now inevitable. One of the important factors in designing a new coal-fueled boiler are the NOx (oxides of nitrogen) reduction measures to be incorporated. A low-NOx burner is reported to have been developed for the combustion of coal. The moving bed type boiler, featuring low temperature combustion, is expected to be prevalent in the future for the most effective NOx reduction in coal combustion. Because of low sulfur content, naphtha is increasingly used as a fuel for thermal power generation. Considering the fact that naphtha is a low-viscosity and high-volatility fuel, the burner of a naphtha-fueled boiler should be of a leak-free structure while the pump should be free of the capitation possible from the high vapor pressure. The tank should be preferably a floating roof type with a water-spray cooling facility. The factors to be considered in designing a methanol-fueled boiler are also discussed in the similar manner. Designing a boiler fueled by LNG and other gas fuels is also discussed.

38854 **APTIC NO. 62598**

Gadomski, Raymond R., Anthony V. Gimbrone, William J. Green, Robert J. Reitz, Paul R. Eisaman, and John T. Dale

AN EVALUATION OF EMISSIONS AND CONTROL TECHNOLOGIES FOR THE METAL DECORATING PROCESS. *J. Air Pollution Control Assoc., 24(5): 484-490, May 1974. 6 refs.*

A simple but effective sampling and analytical procedure is described for determining total organics, carbon dioxide, carbon monoxide, and methane emitted from web offset printing presses. A number of uncontrolled web offset presses were studied in order to assess the effect of press speed, ink coverage, and method of drying on the quantity of emitted organics. The observed emission varied linearly with the product of press speed and ink coverage. The direct flame hot air dryer is to some degree a more effective oxidizer of solvents than the high velocity hot air dryer. The type of paper used had no effect on the quantity of emitted organics; however, it may affect the quality or kind of organics produced. This may be crucial in determining whether or not a smoke or odor problem exists. For controlled sources employing either catalytic or thermal incineration units, conversion efficiencies are reported as a function of temperature. Operational curves are presented for each control system studied indicating the dependency of carbon dioxide, nitrogen oxides, and organic output to incineration temperatures. (Author abstract modified)

38855 **APTIC NO. 60240**

Ganley, John T. and George S. Springer

PHYSICAL AND CHEMICAL CHARACTERISTICS OF PARTICULATES IN SPARK IGNITION ENGINE EXHAUST. *Environ. Sci. Technol., 8(4):340-347, April 1974. 27 refs.*

The formation and emission of particulates in the exhaust gas of a 350 cu in Chevrolet V-8 spark ignition engine mounted on a dynamometer and operated at constant speed and load were investigated. Both leaded (Indolene HO 30) and unleaded (Indolene HO O) fuels were used, and the weight concentration and size distribution of the particles were measured over a wide range of exhaust gas temperatures (90-830 F). A large increase in weight concentration as the exhaust gas temperature decreased from 630-470 F was observed with the leaded fuel and was attributed to the condensation of lead salt vapors in the exhaust system; the weight concentration was constant at all exhaust temperatures above 250 F for the unleaded fuel. The size distributions lay within a relatively narrow band for the unleaded fuel, and no discernible trend with respect to temperature was observed; several size distributions were noted for the leaded fuel, and the size distribution was a strong function of exhaust gas temperature. The shape of the particulates, the effect of engine speed, load, and air-fuel ratio on particulate weight concentration and size distribution, the effect of spark timing on particulate weight concentrations, and the chemical composition of the particulate matter were also examined.

38856 **APTIC NO. 62538**

Helmenstein, S. and F. Martin

PLANNING CRITERIA FOR REFUSE INCINERATOR SYSTEMS. *Combustion, 45(11):11-17, May 1974. 12 refs. (Also: VGB-Krafwerkstech. Mitt. VGB, 52(4), Aug. 4, 1972.)*

The method of incineration for the disposal of refuse and garbage is becoming more attractive since it gives the largest reduction in volume in comparison to other methods, gives hygienically safe residues, heat and residues might be reused, and plants can be sited close to the waste production centers due to the small area requirements. Various factors in planning for refuse incinerator systems are reviewed including plant size, costs, waste materials composition, usable heat, siting, other design factors, and pollution. Heat utilization will improve the economy of waste disposal significantly. Economics, traffic and road conditions, possibilities of heat utilization, and emissions will affect siting. Fly ash, sulfur dioxide, chlorine, and dust from incinerators can be reduced to meet pollution limits without great difficulty through the use of increased stack height, electrostatic precipitators, and other control methods. Incinerators are very closely tied to the regional and structural conditions of a given area, so a detailed study and comparison of various disposal methods and/or systems must be executed when planning refuse disposal.

38857 **APTIC NO. 62582**

Hoshini, Suguru

PROBLEMS OF METAL COATING AND POLLUTION CONTROL MEASURES. *(Kinzoku toso no shomondai to kogai taisaku). Text in Japanese. Preprint, Japan Management Assoc., p. 39-48, June 1974. (Presented at the Japan Management Association National Conference on Pollution Control Techniques, Tokyo, Japan, June 10- 14, 1974. Paper 7.)*

The amounts of vaporized solvent and paint mist calculated for a melamine paint baking finish were 26 ppm and 0.18/N cu m in the coating booth, 70 ppm in the setting room, and 150 ppm in the exhaust gas from the baking furnace. The paint mist can be reduced greatly by using high efficiency coating equipment, such as table model static coating equipment with 75-90% efficiency or a portable static coating equipment with 70-80%, rather than an air-spray gun of 30-60% efficiency. For the recovery of paint mist, two types of coating booths, wet and dry methods, are described. More than 95% of paint mist can be recovered by the wet method. The use of so-called pollution free paints, such as water paints with the advantage of fire safety and disadvantages of dripping and difficulty in application, and powder paints which require high baking temperature (above 180 C) but have a 99% recovery rate of paint particulates, are increasing. The exhaust gas from baking furnaces can be treated by thermal oxidation at 650-800 C or catalytic oxidation at 260-450 C using a noble metal such as platinum. Thermal oxidation requires higher equipment and fuel costs, while catalytic oxidation requires the pretreatment for the removal of plasticizer mist and resin. The sorption method using activated charcoal and others is the well known treatment method for the removal of organic solvents. By the sorption method, formaldehyde using alkaline solutions, butyl cellosolve, and isopropyl alcohol using mixed solvents of water and organics were removed with 98.6, 96.8 and 92.2% efficiencies, respectively.

38858 **APTIC NO. 62373**

Ikeda, Hiroshi, Yoichiro Azuma, and Kinzo Okitsu

DEVELOPMENT OF LOW POLLUTION AUTOMOBILES BY REACTOR SYSTEM. *(Riakuta shisutemu ni yoru teikogaisha no kaihatsu). Text in Japanese. Preprint, Japan Automobile Technical Assoc., Tokyo, p. 271-276, 1974. 4 refs. (Presented at the Japan Automobile Technical Association Lecture Meeting, Tokyo, Japan, May 1974, Paper 37.)*

A reactor system engine was developed with an improved reactor structure and optimum control device, and the engine should be well within the 1975 regulations. The reaction characteristics of the reactor and endurance are tested and discussed. The amount of carbon monoxide emitted is 1.04 gm/km with a 10-mode 1600 AP automobile, hydrocarbons, 0.07 g/km, and nitrogen oxides, 0.05 g/km. These figures are completely satisfactory and well below the 1975 maximum allowable emission standards. With an 11-mode 1800 AP capacity car, the CO concentration is 28 gr/km; HC, 2.37 gr/km; and NOx, 6.62 gr/km. These figures are also much below the standards. Changes in driving modes affect pollutant emissions only temporarily.

38859 **APTIC NO. 61873**

Imatani, Hiroaki

DEVELOPMENT OF LOW NOX BOILERS OF MEDIUM OR SMALLER CAPACITY AND RELATED PROBLEMS. *(Tei-NOx chusho yoryo boiler no kaihatsu to sono mondai-ten). Text in Japanese. Kuki Chowa to Reito (Air Cond. Refrig.), 14(1):225-232, Jan. 1974. 5 refs.*

A review was made of the history of photochemical smog, the mechanism of the occurrence of photochemical smog, the present status of the study on and the environmental pollution by nitrogen oxides, the present status of the control of NOx discharge, and the techniques to suppress NOx formation. The NOx content in the gas discharged from medium and smaller size boilers is about 70 to 230 ppm in the case of gas-fuel package type boilers and 120-310 ppm in the case of oil fuel package type boilers. Heavy oil, Class C, gives NOx most, followed by B and A heavy oils, kerosene oil, and city gas in that order. The NOx content generally increases as the capacity of the boiler increases. The NOx content also increases the NOx content but some exceptions are found. Legal regulations issued in May 1973 in Japan limits the average value of nitrogen dioxide in an hour to less than 0.02 ppm. Suppression of NOx formation is performed by the control of combustion temperature, the control of the oxygen and nitrogen concentration in the flame and in the combustion zone, and by suppressing the residence time of flames in the high temperature zone. Recirculation of the discharged gas is also effective in reducing the NOx concentration. The trouble with smaller size boilers are that these boilers are mostly automated and it is difficult to externally control the combustion conditions.

38860 **APTIC NO. 62356**

Iwasaki, Takashi and Yoshikazu Hagiwara

BEHAVIOR OF POWDER DUST AROUND A STONE-CRUSHING SITE. *(Saisekiba shuhen ni okeru funjin no* *kyodo). Text in Japanese. Preprint, Japan Mining and Metallurgical Inst., Tokyo, p. 161-162, 1974. (Presented at the Japan Mining and Metallurgical Institute Convention, Spring Meeting, Tokyo, Japan, March 26-28, 1974, Paper 2311.)*

Ten stone-crushing plants were investigated to study emissions of powder dust. The dust concentration was measured at different distances leeward of the plant. The concentration decreases from over 15 mg/cu m at about 35 m from the center of the plant to about 6 mg/cu m at a 50-meter distance, thereafter gradually decreasing until it is absorbed in the background concentration of dust caused by the nearby automotive traffic at about 600-700 m. The wind velocity during the measurement was 1 m/sec at one plant and 0.5 m/sec at all others. Quantity and particle size distribution of the dust generated by various types of stone crushers, those of the same dust escaping from the stone-crushing premises, and those of dust generated by the nearby automotive traffic (2 automobiles/min) were measured and shown. The crusher generated 71.0 mg/cu m and dust smaller than 10 microns accounted for 58%. Quantity of the dust generated by automotive traffic was 1.5 mg/cu m with 62 automobiles passing the paved road in average of 2.1 automobiles per min. With 122 automobiles averaging 2.0/min on the non-paved road, the concentration was 56.7 mg/cu m. A bag filter is more effective in reducing the dust emission than a water spray system. Concentration of the dust fall in a nearby town ranged from 5.0 tons/sq km/mo to 24.6 tons within the distance of 0.2-1.1 km from the nearest plant.

38861 **APTIC NO. 62368**

Joslin, J. C.

ENERGY, POLLUTION AND TRANSPORT. *Civ. Eng. S. Afr./Siviele Ing. S. Afr., 16(2):33-38, Feb. 1974. 36 refs.*

On a global basis, transportation has had a major impact on the earth. Transport is discussed against the background of the population explosion, economic growth, and the limits on the earth of certain critical resources and in its ability to purify the evergrowing pollution. Transportation is a giant energy consumer and is by far the largest oil user. It is a great polluter of the cities, sea, and atmosphere. It has enabled urban complexes to cover millions of acres of scarce good soil. The energy crisis is discussed with particular reference to the depletion of oil reserves. Alternate energy sources such as nuclear power, solar, and hydroelectric power are considered. Serious reservations are expressed over nuclear fission power, and fuel limitations for the most promising fusion processes are noted. Sea, air, and noise pollution arising from transporation are analyzed. The invisible effects of oil pollution by itself and combined with other pollutants could be serious if allowed to continue. Land transport is identified as a greater sea polluter than shipping. Supersonic aircraft is the wrong development direction for civil aviation because of the sonic boom, airport noise, and high unit energy consumption. Some suggestions are made for regional transport in the Southern Transvaal complex. Alternative power sources for automobiles are discussed.

38862 **APTIC NO. 62581**

Kaneko, Taizo

DEVELOPMENT OF NON-SOLVENT PAINT AND POLLUTION-FREE PAINTS. *(Muyozai toryo no kaihatsu to toryo no mugaika e no taisaku). Text in Japanese. Preprint, Japan Management Assoc. p. 29-38, June 1974. (Presented at the Japan Management Association National Conference on Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 7.)*

The amount of organic solvent used in paint materials is about 467,000 tons and constitutes 43.6% of the total amount of paint produced. The evaporation of solvents after paint application is the main concern for air pollution, along with emissions during the production process. The organic solvents used for paints are numerous, but most commonly used are aliphatic and aromatic hydrocarbons, mineral spirits, alcohols, esters, and ketones. These compounds are the source of one of the hydrocarbons causing photochemical smog8 rather than the odors. Control measures proposed for air pollution due to organic solvents contained paint are: use of photochemically inactive solvents, drastic reduction in the amount of solvent contained in paints, use of non-solvent paints, use of water in place of organic solvents, removal of vaporized solvent by absorption or adsorption, and converting the vaporized solvent into a harmless substance before discharging. Detailed applications of methods relating to production of different types of paints are given in tubular form. The pollution problem related to the paint application process includes solvent evaporization, emission of various pollutants such as decomposition products produced during drying, and the disposal of waste paint and solvent. The development of a photochemically inactive solvent of the naphthene type or hydrogenation product of aromatic hydrocarbons, the development of high efficiency paint application equipment, and development of a separation and recovery system for solvents from waste material are some of the most important approaches to the control of paint pollution.

38863 **APTIC NO. 62388**

Krug, Herbert, Wolfgang Naundorf, Dietmar Trommer, and Dieter Schoenherr

STUDY OF THE BRIQUETTING OF COAL/COKE, PART I: STUDY OF THE UNDERLYING PRINCIPLE. *(Beitrag zur Kohle/Koks-Brikettierung, Teil I: Grundlagenuntersuchung). Text in German. Neue Bergbautech., 4(4):292-299, April 1974. 14 refs.*

Past experience has shown that joint briquetting of dry coal and coke dross yielded satisfactory quality only with very low quantities of coke. For obtaining a high-quality low-smoking fuel containing 50% coke, grinding experiments were carried out in the laboratory. After 23 minutes of grinding in a steel ball mill the coal/coke dross had a grain size of 0.63/0mm, down from 3.15/0mm. No further reduction of the grain size was achieved by continued grinding. Briquetting experiments with dry coal (20% water content) and coke ground to 0.63/0mm grain size yielded positive results with as high a coke dross fraction as 50%. Joint grinding of the two components yielded a better crushing strength of the briquettes than separate grinding.

38864 **APTIC NO. 62867**

Kuchak, Y. A.

ELECTRO-AEROSOL PESTICIDES AND THE HYGIENIC ASPECTS OF THEIR APPLICATION. *(Elektroaerozoli pestitsidov i gigiyenicheskiye aspekty ikh primenneiya). Text in Russian. Gigiena i Sanit., no. 1:10-13, 1974. 1 ref.*

The complex hygienic aspects of the use of electro-aerosols of the pesticides methylmercaptophos, butyphos, dimethoate, carbaryl, polychloropinene, and polychlorocamphene were studied in a closed space and in field experiments. Compared with neutral atomized aerosols of the same pesticides, the electro-aerosols settled more densely on the plants, showed high near-surface concentrations, and small degree of entrainment. Thus, electro-aerosols cause less air pollution, and permit the pesticide expenditures to be reduced.

38865 **APTIC NO. 61838**

Kumagaya, Takeo

POLLUTION PROBLEMS IN HEAT TREATMENT FACTORY. *(Choshitsu netsushori kojo no kogai mondai). Text in Japanese. Kinzoku (Metals) (Tokyo), 44(3):18-19, March 1974.*

Air pollution problems in metallurgical factories which utilize batch-type and continuous heat treatment furnaces burning heavy oil are discussed. Soot, smoke, and sulfur dioxide are emitted from the tempering furnace. Control measures to improve occupational conditions and ambient air quality are: utilization of less manpower, combustion of city gas, and use of a water-soluble coolant in place of the tempering oil.

38866 **APTIC NO. 62009**

Kunselman, Paul, H. T. McAdams, Charles J. Domke, and Marcia Williams

AUTOMOBILE EXHAUST EMISSION MODAL ANALYSIS MODEL. *Calspan Corp., Buffalo, N. Y., Office of Air and Water Programs Contract 68-01-0435, Rept. EPA-460/3-74-005, 179p., Jan. 1974. 4 refs.*

NTIS: PB 229635/AS

A mathematical model of an automobile s emission rate is described which can be used to calculate the amounts of hydrocarbons, carbon monoxide, and nitrogen oxides emitted by individual vehicles or groups of vehicles which are driven over arbitrary driving sequences. The model requires as input the amounts of the three pollutants emitted by individual automobiles over short duration driving sequences (modes); and, thus, the model is intended to be used to predict emissions from vehicles being operated within the ranges of speed and acceleration covered in the input emission data. The validity of the model has been investigated by prediciting sections of the Federal Test Procedure and comparing predicted and actual values.

38867 **APTIC NO. 62514**

Matsumoto, Yasuo

CONCENTRATION OF FORMALDEHYDES EMITTED FROM PLYWOOD IN THE LIVING ENVIRONMENT. *(Jukankyoka ni okeru goban kara hassan suru horumu arudehido no kichu nodo ni tsuite). Text in Japanese. Mokuzai Kogyo (Wood Ind.), 29(1):18-24, Jan. 1974. 8 refs.*

Emission of formaldehyde from plywood is governed by many factors. The estimation of atmospheric CH2O concentration in living environment was attempted from the experimental data obtained by the dessicator method and by the actual measurement at various temperatures, humidity, and ventilation rates. In a test chamber, plywood samples were placed in a temperature of 30 C and humidity of 80% RH for 4 hr. The atmospheric concentration was measured after 5, 24, and 48 hr. The CH2O concentration decreased with time and increased with the amount of ventilation, except for a few cases. Applying Fujii s equation, the atmospheric concentrations at different ventilation rates were calculated. When the dessicator value of CH2O is 5 mg/l or less as set by the environmental standard, the atmospheric concentration of CH2O is less than 1 ppm, providing that the ventilation volume is higher than 2V. For the estimation of concentration at different temperatures and humidities, an experimental equation was derived, and the conversion coefficients were obtained. The estimated values thus obtained were in good agreement with measured values.

38868 **APTIC NO. 62147**

Michel, Bernhard, Manfred Neufelder, and Dieter Pruggmayer

POLLUTANT EMISSIONS FROM DOMESTIC HEATERS. WASTE GAS MEASUREMENTS ON OIL AND GAS-FIRED HEATERS. *(Schadstoffemissionen von Haushaltsfeuerungen Abgasmessungen an Oel- und Gasfeuerungen). Text in German. Staub, Reinhaltung Luft, 34(5):164-172, May 1974. 1 ref.*

In order to establish realistic emission values for fireplaces, the exhaust gases of 54 oil heaters and 30 gas heaters have been analyzed in the heating periods 1971-1972 and 1972-1973. The concentration of oxygen, carbon dioxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and solid particles (soot) have been determined. The data given include concentrations of exhausts (ppm) and specific emission (g pollutant/10 to the 4th kcal) before and after service. The average values of specific emissions from all fireplaces agree with known values of oil and gas heaters as far as NOx and soot are concerned. Carbon monoxide, on the other hand, is emitted in much higher quantities than assumed previously. The service of the burners causes on the average a slight decrease of the soot number and heat losses but no reduction of the CO or NOx emissions.

38869 **APTIC NO. 61811**

Michelfelder, S., H. Bartelds, T. M. Lowes, and B. R. Pai

CALCULATION OF THE HEAT FLUX AND THE TEMPERATURE DISTRIBUTION IN COMBUSTION CHAMBERS. *(Berechnung des Waermeflusses und der Temperaturverteilung in Verbrennungskammern). Text in German. Brennstoff-Waerme-Kraft, 26(1):5-13, Jan. 1974. 18 refs.*

Two mathematical models, the Spalding and the zone method, for calculation of the temperature and heat flux in combustion chambers are described. Also, an improved flux model is introduced describing the heat flux in four directions (two radial and two axial directions). Combustion chamber experiments and aerodynamic model studies were performed to supply the necessary data for testing the described models and for further developing them. For a simple diffusion flame the heat flux distribution was calculated with both methods and compared with the measured values. There was considerable disagreement between the calculated and measured data. The zone model brought the best agreement with the measured heat flux. At certain points differences of up to 30% existed. The uncertainty of the flow characteristic and the coarse division of the combustion chamber accounted for this. The uncertainty of the flow characteristic can be eliminated by measurement of the velocity in the range between 0.5 and 4 m/sec. The Spalding method requires further improvement such as inclusion of more flux directions and use of a better turbulence model. The development of empirical or theoretical models for the soot formation during combustion is of great importance for the application of the Spalding and the zone models because of the influence of soot on the flame radiation. The measured soot concentrations in propane and oil flames may be a first step for solution of this problem.

38870 **APTIC NO. 61837**

Miyakawa, Takeshi

PRECAUTIONS IN PRACTICAL USE OF ELECTROLYTIC CARBURIZING METHOD. *(Denkai shintanho no jisshijo no chuiten). Text in Japanese. Kinzoku (Metals) (Tokyo), 44(3):22-23, March 1974.*

Improvements in the electrolytic carburizing furnace are discussed. In the former cyanite salt method, the hydrogen cyanide vapor polluted the working atmosphere. A problem in former electrolytic carburizing methods are possible emissions of ionized chlorine as chlorine gas from the reaction of the sodium chloride at the cathode. Determination of the chlorine gas emanating from the liquid surface showed that there is little release of chlorine with this method because of its ionic reactions with other compounds during the electrolytic carburation. All such emissions were below environmental standards.

38871 **APTIC NO. 62585**

Mizobuchi, Izumi

THE PRESENT STATE OF NOX EMISSION BY MEDIUM AND SMALL BOILERS. *(Chusho yoryo boira no NOx no genjo ni tsuite). Text in Japanese. Preprint, Japan Management Assoc., p. 41-50, June 1974. (Presented at the Japan Management Association National Conference on Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 8.)*

The nitrogen oxides emission (nitric oxide 90-95%) is known to be governed by the temperature in combustion chamber, fuel retention time, and air ratio (NO increases with oxygen ratio).

Therefore, the NOx control measures are focussed on the lowering of combustion temperature, reduction in retention time, and decrease in air ratio. The date of NOx emissions from boilers with less than 40 tons/hr capacity measured at the end of 1973 were compiled and the basic NOx emission pattern of the existing boilers is indicated. For package boilers with limited space problems, effective control measures are the use of high quality fuel such as kerosene and butene gas (nitrogen content less than 0.013%), the use of a low NOx burner (shorter retention time and thin film flame combustion), lowering the combustion temperature (by multistage combustion with 28-30% decrease in NOx emission, recirculation of exhaust gas with 9-23% decrease, a combination of recirculation and steam spraying with 49-53% decrease), an increase in the ratio of cooling area, and a change in the flow pattern of the combustion chamber (horizontal reverse firing with 14.4-57.7% reduction in NOx emission, depending on the type of fuels).

38872 **APTIC NO. 62117**

Nagakura, Hiroshi

ACTUAL RESULTS OF LIQUEFIED NATURAL GAS BURNING. *(LNG daki jisseki ni tsuite). Text in Japanese. Preprint, Japan Society of Thermal Power Engineers, Tokyo, p. 35-50, 1974. (Presented at the Japan Society of Thermal Power Engineers Training Conference on Fuel, Tokyo, Japan, March 29, 1974, Paper 4.)*

Three thermal power generation boilers fueled by liquefied natural gas (LNG) have been operating in the Minami Yokohama Power Plant of the Tokyo Electric Power Co., since May, 1970. The LNG used was imported from Alaska and Brunei, Borneo. The composition of Alaskan LNG is somewhat different than that from Brunei, the former composed of 99.82% methane and the latter 90.24%, but both types contain no sulfur. Physical and chemical characteristics of the LNG are presented. Operation of the LNG tankers, arrangement of the loading/unloading and storage facilities, and construction of the gasifiers and boilers are described. The boilers are the box type that gives uniform thermal expansion and distribution. The detailed specifications of the boiler are tabulated. Compared with a heavy oil-fueled boiler, the LNG boiler gave a power generation efficiency lower by about 1.4%, due to the 2.4% lower boiler efficiency. The lower boiler efficiency is attributed to the greater pressure loss noted with LNG. The total generated output in the first half of 1973 amounted to 3,477,000 MW while the LNG consumption during the same period was 604,000 tons. The scales deposited in the boiler furnace were analyzed. They contained neither ash nor combustibles but were of a powder substance chiefly composed of iron oxide. Negligible corrosion of the coating material on the lower temperature section of the air preheater was observed. Several elements are now being tested to find the most suitable material for construction of an LNG boiler. A denitrization device for reduction of nitrogen oxides in an LNG boiler is also being studied.

38873 **APTIC NO. 62408**

Nagata, Katsuya, Yuji Honma, Mikio Hirota, and Kunihiro Matsubara

INFLUENCE OF BURNING CONDITION ON NOX EMISSION FROM BOILERS. *(Jitsudo boira ni okeru NOx haishutsu jokyo to nensho joken to no kanren). Text in Japanese. Nenryo Kyokai-shi (J. Fuel Soc. Japan) (Tokyo), 53(4):273-283, April 1974. 10 refs.*

Nitrogen oxide emissions were measured from 5-26 ton/hr boilers used for air conditioning or steam production in a factory. The influences of burning conditions on NOx formation were studied. The NOx emission was 1-5 kg/10 to the 7th power kcal. Boiler capacity did not influence NOx emission. The NOx emission increased as the flame temperature increased. The heat release rate in the combustion chamber had the same relationship. The NOx-excess air factor relation was divided into three patterns. The tested boiler indicated a pattern determined by the range of the excess air factor and the fuel-air mixing in the combustion chamber. The type of fuel affected NOx emission. The NOx emission increased in the order of town gas, kerosene, and heavy fuel oil. Nitrogen oxides increased in boilers firing high nitrogen-content fuel oil. The fraction of N converted to NOx was 39%.

38874 **APTIC NO. 62519**

Nagumo, K. and K. Amaya

RELATION BETWEEN CYAN COMPOUNDS AND SYMPTOMS CAUSED BY TOKYO SMOG: II. SOURCES OF CYAN COMPOUNDS AND THE CONCENTRATION OF OXIDANTS. *(Tokyo sumoggu ni okeru higai shojo to shian kagobutsu tono kankei (dai 2ho) shian kagobutsu no hasseigen to okishidanto nodo). Text in Japanese. Koshu Eisei (Public Health), 38(2):114-118, Feb. 1974. 5 refs.*

The first report pointed out that the symptoms caused by photochemical smog in Tokyo are similar to those by cyanide compounds poisoning. Exhausting sources of cyanide compounds are factories producing acrylonitrile, coke furnaces, and imperfect combustion of coal and fuels. The excess hydrogen cyanide as a by-product of acrylonitrile production is estimated to be 35,500 tons in 1971 in Japan. This excess HCN must be burned, but some fraction of it may be emitted due to its imperfect combustion. Hydrogen cyanide is also produced when coke is made from coal. 14,400 tons of HCN are estimated to be produced in coke furnaces in 1974 in Japan. Ammonium thiocyanate emitted from coke furnaces may change to cyanide compound after reacting with other pollutants in the air. The increase of ammonia concentration in the air (which is due to the use of NH3 for the elimination of SO2) makes water soluble cyanide compounds which increases the damage to human body. It is remarkable that the oxidants concentration is at a minimum when damage by the photochemical smog occurs in Tokyo. This lowering of oxidants concentration may be due to reactions with cyanide compounds.

38875 **APTIC NO. 62474**

Nishida, Konosuke, Tsuneo Honda, and Taeko Tsuji

CASES OF SEWAGE TREATMENT PLANT ODORS. *(Gesui shorijo akushu no chosarei). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(4):1-12, March 1974. 9 refs.*

In a sewage treatment plant in Osaka prefecture, two investigations were conducted with regards to odor components and concentrations in the fall of 1973. In the air near the surface of the aeration tank, 0.061-0.210 ppm of ammonia, 0.055 ppm of hydrogen sulfide, 0.0494 ppm of trimethylamine, 0.0145 ppm of methyl mercaptan, and 24.3-72.5 ppm of total hydrocarbons were detected. The concentrations of these elements were all much lower in samples taken at the settling pond, pre-aeration tank, deodorization system entrance, deodorization system exit, and effluent exit. The maximum concentration of ozone from the odor producer is 4500-5300 ppm. Some ozone escaped without reacting with odors at the exit of the deodorization system. All samples except for two for mercaptan levels, passed the regulation standards for five odorous elements. The level of ammonia in all samples was much lower than the maximum allowable standard. Hydrogen sulfide at the aeration tank was within the regulation, and other samples were all much lower than the lower limit of the standard. The trimethylamine levels in all samples were within regulations. Except for the sample at the settling pond, the dilution multiplication number was generally low.

38876 **APTIC NO. 62407**

Nishizawa, Yoshihiko

ON THE BAD SMELL GASES PRODUCED FROM THE INSECTICIDE WASTE. *(Noyaku seizo haikibutsu kara hassei suru akushu gasu no seisei genin ni tsuite no* *ichikosatsu). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 13(2):79-85, April 1974. 13 refs.*

Waste water from thy production of the insecticide Papthion was treated to obtain a tarry substance, which was then stored. Abrupt decomposition took place during storage, and the decomposition gas with a bad odor was emitted to the air outside the factory. A careful investigation of the cause revealed that the tar had the property of reacting with water exothermically to decompose at temperatures above 80 C. It is quite probable that, while the tar was kept warm, the temperature of the warming water rose to 90 C, and consequently the tar was heated locally at 80 C. Since the storage was under virtually adiabatic conditions, the heat gradually evolved inside the storage tank, accumulated without dissipation, and thus, accelerated the exothermic decomposition reaction. As a result, a rapid decomposition of the tar occurred and odors were evolved.

38877 **APTIC NO. 61809**

Oelert, Hans Henning, Wolfgang Mayer-Guerr, and Joachim Zajontz

THE COMBUSTION OF GASOLINE HYDROCARBONS IN AUTOMOBILE ENGINES. I. AROMATICS. *(Zur motorischen Verbrennung von Benzinkohlenwasserstoffen. I. Aromaten). Text in German. Erdoel Kohle Erdgas Petrochem., 27(3):146-152, March 1974. 19 refs.*

Hydrocarbons emitted by combustion processes contain a large number of components which should be differentiated as far as possible for better evaluation of their importance concerning environmental pollution. For this reason the sum of hydrocarbons as well as the individual C6-to C9 aromatics emitted by a four- cylinder, 1584 ccm, 49 HP engine were measured by gas-liquid chromatography. Twelve engine conditions were simulated on a chassis dynamometer. Engine revolution numbers of 1000, 2000, 3000 and 4000 rpm were used. The four model fuels used for the experiments corresponded largely to premium gasolines. Their lead concentrations were 0.33, 0.31, 0.15 and 0.40 g/l. Of the non-aromatics they contained 67.5, 57.7, 54 and 79% by volume. Referred to the total sum of hydrocarbons, the quantity of non- aromatics in the fuels and in the exhaust gas did not differ much. For all individual aromatics a linear relationship of the content in gasoline versus the content in the exhausts is given. The constant factors for these relationships are determined by the engine parameters. There is a limited production of benzene and toluene during the combustion process by dealkylation of higher aromatics. There is a certain degree of isomerization (no equilibrium), based on the ratio of xylene to ethylbenzene. Flamequenching is a major reason for hydrocarbon emissions, whereby the apparent relationship between the concentration in the exhaust gas and the physical characteristics (boiling point) cannot be fully established for reasons of its complexity. Evaluation of the absolute emissions results to 0.2-0.5% of the gasoline input for the total hydrocarbons and 0.2-0.7% of the input for benzene. That means up to 5 g/h benzene for the car investigated. A first comparison with results of environmental studies is made.

38878 **APTIC NO. 62219**

Pervier, J. W., R. C. Barley, D. E. Field, B. M. Friedman, R. B. Morris, and W. A. Schwartz

SURVEY REPORTS ON ATMOSPHERIC EMISSIONS FROM THE PETROCHEMICAL INDUSTRY. VOLUME I. (FINAL REPORT). *Air Products and Chemicals, Inc., Marcus Hook, Pa., Houdry Div., Office of Air and Water Programs Contract 68-02-0255, EPA-450/3-73-005a, 260p., March 1974.*

A study of air pollution from the petrochemical industry was undertaken to provide data that the Environmental Protection Agency can use in the fulfillment of the Clean Air Amendments of 1970. The scope of the study included most petrochemicals which fall into one or more of the classifications of large production, high growth rate, and significant air pollution. The processes for the production of each of these selected chemicals were studied, and the emissions from each tabulated. A survey report prepared for each process provides a method for ranking the significance of the air pollution from these processes. The information sought includes industry descriptions, air emission control problems, sources of air emissions, statistics on quantities and types of emissions, and descriptions of emission control devices currently in use. The principal source for these data was an industry questionnaire, supplemented by plant visits, literature searches, in-house background knowledge and direct support from the Manufacturing Chemists Association. A method for rating the significance of air emissions was established and used to rank the processes in order to select candidates for in-depth study. These studies include technical and economic information on best systems of emission reduction, the economic impact of these systems, deficiencies in petrochemical pollution control technology and potential research and development programs to overcome these deficiencies. These studies also recommend specific plants for source testing and present suggested checklists for inspectors. This volume covers the following processes: acetaldehyde via ethylene, acetaldehyde via ethanol, acetic acid via methanol, acetic acid via butane, acetic acid via acetaldehyde, acetic anhydride, adipic acid, adiponitrile via butadiene, and adiponitrile via adipic acid. For each process, the report includes a process description, a process emission inventory, a catalog of emission control equipment, a list of producers, and an evaluation of the significance of the air pollution from the process. Also included is a summary table of emissions to the atmosphere from all the processes studied.

38879 **APTIC NO. 62384**

Rasch, Rudolf

INCINERATION. *(Muellverbrennung). Text in German. Brennstoff-Waerme-Kraft, 26(5):223-228, May 1974. 92 refs.*

A literature survey of articles published in the Federal Republic of Germany over the past 2 years concerning incineration is given. The problem of hydrochloric acid emissions by incinerators and possible cleaning methods are discussed. Public authorities claimed that flue gas scrubbing for the purpose of elimination of hydrogen chloride has achieved a state of technical maturity, whereas operators of such facilities claim that this is not so. Incineration reduces the weight of trash to 35% and the volume to 10%. Opponents of incineration claim that 70% of the trash is emitted as a waste gas. A comparative survey of various trash treatment methods (controlled tipping, anaerobic and aerobic decomposition, trash gasification, and trash incineration) is given and the decomposition time and the expected waste gas quantities are compared. The total emission from incinerators is 3 to 5 cu m/kg trash and from trash gasification 0.3 to 0.5 cu m/kg trash. All large incinerators use waste heat for power production or remote heating. An international survey of all major incinerators presently in operation is given classified by grate system.

38880 **APTIC NO. 62515**

Rasch, R.

LEAD IN WASTE SEEN IN CONNECTION WITH WASTE INCINERATION. *(Blei im Muell bei der Muellverbrennung). Text in German. Aufbereitungs Technik, 15(5):234-237, 1974. 21 refs.*

Exact measurements of the lead concentration in trash do not exist. Estimates put the amount at 7 to 30 g per 100 kg trash. The emission of lead from incinerators is known and was found to amount in an Essen incinerator on the average to 0.3% of the lead content entered with trash, in the incinerator in Rotterdam-Nord a similar result was obtained. The lead emission load from incineration according to an investigation in Rotterdam was 0.017 microgram/cu m. At the incineration of trash in an oxidizing atmosphere with a customary fuel-to-air ratio of 2.5 only lead oxide can develop, which adheres to fly ash and deposits on heat exchanger surfaces. This lead oxide reacts with sulfur dioxide from the flue gases and with oxygen, and lead sulfate (PbSO4) is formed. It is nearly insoluble and does not pose any danger in case of tipping the fly dust and incrustations from incinerators into sanitary landfills.

38881 **APTIC NO. 62550**

Robertson, Clive, A. M.

THE EMISSION OF HCL FROM MUNICIPAL INCINERATORS AND RELATED STUDIES. *Solid Wastes Manage. Refuse Removal J., 64(3):139-154, March 1974.*

Results are presented from experiments performed on a municipal incinerator using water sprays to cool the flue gases in order to determine the extent of hydrogen chloride emission from polyvinyl chloride-containing refuse. The results indicated that PVC is not the major produce of HCl in municipal incinerators burning present day refuse; about 76% of the HCl emissions come from other sources. Each 0.1% increase in the proportion of PVC in the refuse produces an increase in the HCl concentration of about 40 mg/cu m at normal temperature and pressure. Polyvinyl chloride increases the HCl concentration in the flue gases by about 24% when burning present day domestic refuse which has a PVC content of about 0.15%. It appears unlikely that HCl emissions from municipal incinerators burning only domestic refuse will exceed 460 mg/cu m at normal temperature and pressure in the foreseeable future since the PVC content of the refuse will not rise much above its present level. The addition of sodium carbonate to the refuse reduces the HCl emissions, but the reduction is not large enough to justify its use in this manner. No chlorine or phosgene gas was detected in the flue gases during any of the tests.

38882 **APTIC NO. 62392**

Schilling, H.-D.

COAL REFINING. *(Kohleveredlung). Text in German. Brennstoff- Waerme-Kraft, 26(4):137-140, April 1974. 146 refs.*

A literature survey on articles dealing with coke production, power production from coal, gasification of hard coal, coal liquifaction, hard coal treatment, and new processes on the basis of activated coal from hard coal is given. Two processes for flue gas desulfurization were developed using activated coal made of hard coal of which one is actually being tested on a large scale. Detailed citations of papers dealing with these subjects are given.

38883 **APTIC NO. 62671**

Stein, Arnold

POINT SOURCE EMISSION INVENTORY FOR CALIFORNIA (EXCLUDING THE COUNTY OF LOS ANGELES) (FINAL REPORT). *Pacific Environmental Services, Inc., Santa Monica, Calif., Environmental Protection Agency Contract 68-02-1034, Task 1, Program Element 2A4136, Rept. EPA-450/3-74-017, 15p., Feb. 1974. 1 ref.*

NTIS: PB 231698/AS

Results are reported for an emissions inventory for the state of California, excluding the county of Los Angeles. Emissions of air contaminants from point sources discharging more than 100 tons/year of either particulate matter, sulfur dioxide, hydrocarbons, carbon monoxide, or nitrogen oxides are quantified and assembled in a format suitable for use in the completing the National Emissions Data Systems forms for presentation in computer readout form. (Author abstract modified)

38884 **APTIC NO. 61899**

Takahashi, Takeo

FUTURE OF PETROLEUM FUELS VIEWED FROM RESOURCES AND AIR POLLUTION. *(Shigen oyobi kenkyo osen kara mita sekiyukei nenryo no doko). Text in Japanese. Nihon Kikai Gakkai-shi (J. Japan Soc. Mech. Engrs.), 77(663):212-218, Feb. 1974. 18 refs.*

The consumption of petroleum in Japan reached 250 million kl in 1971, which was 73% of the total energy consumed that year. The total demand for oil in the world was 2.6 billion kl in 1970, but it will reach about 5 billion kl in 1980. Although it is said that there are only 30 more mining years of petroleum, much more oil may be buried. Oil shale and tar sand will be used in the near future. The biggest problem for Japan is that she owes much of her oil to the politically unstable Middle East countries. It is anticipated that Japan will need 330 million kl of oil in 1977, the larger part of which should be low-sulfur oil for the sake of air pollution control. The supply of low-sulfur oil is limited, however, so that techniques for the desulfurization of oil must be developed. These include desulfurization of heavy oil, desulfurization of exhaust gases, and gasification of heavy oil. The two methods for the first technique are indirect and direct desulfurization. Methods for the second technique are dry type and wet type. About five million N cu m/hr of exhaust gases are desulfurized by these methods. Attachment of electrostatic precipitators and improvement of combustion methods are necessary to control dust. Improvement of combustion methods and a changeover from heavy oil to light oil or gas are necessary for the control of nitrogen oxides.

38885 **APTIC NO. 62410**

Vranos, Alexander

TURBULENT MIXING AND NOX FORMATION IN GAS TURBINE COMBUSTORS. *Combustion Flame, 22(2):253-258, April 1974. 13 refs.*

An order of magnitude analysis is presented which shows that large-scale mixing in gas turbine combustors controls the stoichiometry of the combustion process at typical engine operating conditions. Fuel lean combustion, a desirable condition for low nitrogen oxide formation rates, is thereby precluded for those combustors where fuel and air are fed separately. The NOx formation is dependent primarily on the amount of fuel burned and not on the overall mixture ratio. This is due to the fact that combustion times in the flammable range are very much shorter than mixing time. Low-pressure combustor test data indicate a fixed rate of NOx generation consistent with a mixing rate-limited mechanism. Significant levels of free carbon in lean mixtures support the conclusion. (Author abstract modified)

38886 **APTIC NO. 62442**

West, P. J.

WASTE MANAGEMENT FOR NUCLEAR POWER. *Bull. Int. AEC, 16(1/2): 78-89, 1974.*

When waste management is considered in the field of nuclear power, wastes from all sections of the nuclear fuel cycle must be taken into account. The fuel cycle includes activities to produce the fuel for use in the reactor, the operation of the reactor for the production of electricity, and the reprocessing of the spent fuel for the recovery of reusable material. Mill tailings have low radioactivity, but can be a dust nuisance because of wind erosion. Water can be sprayed on the tailings to reduce dust. The enrichment process using gaseous diffusion produces some uranium and some nonradioactive chemical wastes. In uranium fluoride conversion plants, sulfur oxides, nitrogen oxides, hydrocarbons, and fluorine and fluoride are produced and emitted to the air. The isotopic enrichment complex produces sulfur oxides, nitrogen oxides, and fluorides. Liquid wastes are also produced which can be treated to remove pollutants and radioactivity. Essentially all of the excess heat from nuclear power plants is transferred to the cooling water. Fuel reprocessing plants emit liquid and gaseous constituents. The gases include SOx, NOx, HC, and F. The management and control of radioactive solids, liquids, and gases is reviewed.

38887 **APTIC NO. 62436**

Wildeman, Thomas R.

THE AUTOMOBILE AND AIR POLLUTION. A CHEMICAL REVIEW OF THE PROBLEM. *J. Chem. Educ., 51(5):290-294, May 1974. 23 refs.*

Some of the chemical principles which are important to the operation of the automobile and to pollution formation and control are discussed. The analysis focuses on the question of whether chemical principles alone can explain the concentrations of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen that were emitted from cars in relatively great quantities before pollution control devices were required. The first cause of air pollution is that carburetors are purposely set rich to obtain maximum power. Increasing the air/fuel ratio to leaner mixtures will cause loss of power and more NOx formation. If oxygen is limited unburned HC is produced and more CO is produced, instead of carbon dioxide. Various driving modes can also affect pollution emissions. Basically, the major effect of the air/fuel ratio is variations in CO emissions. The effects of octane rating and lead additives on the compression ratio are analyzed using the First Law of Thermodynamics. The calculations also provide the basis for estimating the temperature and pressure in the combustion cylinder prior to and during ignition. These parameters are important factors for the determination of the level of NOx emission. The formation of nitric oxide and nitrogen dioxide by internal combustion engines is analyzed using the Second Law of Thermodynamics. The equilibrium constants for the reactions that affect their formation change with temperature are discussed.

38888 **APTIC NO. 62262**

Wilson, R. P., Jr., C. H. Waldman, and L. J. Muzio

FOUNDATION FOR MODELING NOX AND SMOKE FORMATION IN DIESEL FLAMES FINAL REPORT FOR PHASE I. *Ultrasystems, Inc., Irvine, Calif., Coordinating Research Council, Inc., and Office of Air and Water Programs Contract 68-01-0436 and 68-02-0222, Rept. EDA-460/3-74- 002a, 84p., Jan. 1974. 89 refs.*

NTIS: PB-231067/AS

A mathematical modeling of diesel combustion with nitrogen oxides formation and smoke is sought to guide the development and design of engines. A foundation for a model was established in Phase I with the following four activities. First, single cylinder emissions data was generated; NOx and soot were affected 40% or more by seven parameters: divided chamber, prechamber volume ratio, compression ratio, exhaust gas recirculation (EGR), water injection, fuel orifice size, and air swirl. Secondly, three existing models were critically reviewed based on treatment of physical heat release mechanisms, ability to predict emissions behavior, and the need to readjust empirical coefficients. Third, a mechanistic heat release model was outlined with treatments of the macroscale mixing (air swirl and fuel spray) and the molecular mixing (diffusion flame profiles). Finally, measurements of air motion, fuel dispersion, temperature, and nitric oxide in the diesel combustion environment were designed in order to resolve key questions about mechanisms. (Author abstract modified)

38889 **APTIC NO. 62434**

Winchester, J. W.

APPLICATION OF NEUTRON ACTIVATION ANALYSIS TO THE INVESTIGATION OF NATURAL AND POLLUTION AEROSOLS. *J. Radioanal. Chem., 19(2): 311-317, 1974. 18 refs.*

Experiments with neutron activation analysis for measuring trace elements in aerosols are discussed. By comparing emissions inventory predictions with measurements, all important sources can be verified. Estimates were made of the emission of 30 elements from major fuel combustion sources (including stationary and transportation sources) in the Chicago area. The relative importance of natural and manmade sources was determined in a study of Chicago pollution and wind direction and other meteorological parameters. An area-wide survey of lead, copper, and cadmium in the Chicago area showed that these three elements were derived from widely distributed pollution sources, except for Cu which had an additional pollution source highly localized in one small region. A further study was conducted of 25 stations in Northwest Indiana, including some rural stations, to assess natural terrestrial sources for some of the elements measured. The relationship between particle size distribution and chemical composition was also used to determine the sources of the aerosols. Several diurnal variation studies, aircraft sampling, and studies of the chemistry of aerosol transformation are also described. The latter included studies of the correlation of lead and halogen composition in urban aerosols, the interpretation of halogen composition of marine and pollution aerosols by computer modeling theory, and the study of enrichments of certain trace substances in aerosol droplets formed during bubble bursting at the sea surface.

38890 **APTIC NO. 61835**

CARBON MONOXIDE. *(Koolmonoxide). Text in Dutch. Chem. Weekblad, 70(5):11-12, Feb. 1, 1974.*

Data on the physiological effects, natural and anthropogenic sources, and natural decay of carbon monoxide, as well as preliminary results of CO concentration measurements being carried out in Eindhoven on traffic-free Sundays are presented. Some 90% of all anthropogenic CO is due to automobile traffic. Oceans, oxidation of methane in the upper troposphere and in the tropopause, and assimilation defects are the basic sources of natural CO. Carbon monoxide is decomposed in the atmosphere by oxidation processes in the upper layers of the atmosphere and by soil microorganisms. Carbon monoxide measurements now being taken in Eindhoven seem to indicate significantly reduced CO concentrations in places with heavy traffic on Sundays when all traffic is banned.

1973

38891 **APTIC NO. 62663**

Axtell, Kenneth, Jr. and Scott D. Thayer

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME V - AMUSEMENT PARKS (FINAL REPORT). *Geomet, Inc., Rockville, Md., Environmental Protection Agency Contract 68-02-1094, Task Order 3, Rept. EPA-450/3-74-003-e, 48p., Nov. 1973. 7 refs.*

NTIS: PB 231704/AS

A general methodology is presented which permits relating parameters descriptive of traffic behavior around amusement parks to the descriptive characteristics of the parks themselves which in turn are related to air quality. Data are tabulated for the following: general information on amusement parks; attendance, employment, and parking at amusement parks; representative distribution of hourly arrivals and departures on a normal summer weekday and on a July or August weekend day; vehicle exhaust emissions at idle in grams per minute; an example queue calculation when gate capacity is exceeded; and atmospheric stability categories. The period when meteorological conditions are least favorable for diluting pollutants is the period when amusement parks are essentially not in use.

38892 **APTIC NO. 62615**

Ayres, Robert U. and Stedman Noble

ECONOMIC IMPACT OF MASS PRODUCTION OF ALTERNATIVE LOW EMISSIONS AUTOMOTIVE POWER SYSTEMS (APPENDICES) (FINAL REPORT). *International Research and Technology Corp., Washington, D. C., Dept. of Transportation Contract DOT-OS-20003 (amended), Rept. DOT-OS-20003-APP, IRT-287-R, 168p., March 6, 1973. 8 refs.*

NTIS: PB 219965

Appendices to a report on possible effects to industry, labor, and the economy resulting from mass production of unconventional low emissions automotive propulsion systems (emission-controlled Otto Cycle internal combustion engines, regenerative free turbine engines, and Rankine cycle engines) are presented. The appendices contain: Title II of the Clean Air Act (42 USC 1857), evidence of probable consumer attitudes, estimate of plant and equipment currently required for production of the Otto Cycle 70 engine, the input-output model used by the contractor, printouts of selected outputs, and the statement of work for the research. (Author abstract modified)

38893 **APTIC NO. 61890**

Ayusawa, Tadashi, Takaaki Nemoto, and Souk Hong Jo

EFFECTS OF POWER CHARACTERISTICS ON EXHAUST EMISSIONS. *(Haiki haishutsuryo ni oyobosu doryoku tokusei no eikyo). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:25-32, June 1973. 2 refs.*

Exhaust gases from domestic 360 cc, 4-cycle and 2-cycle automobiles were sampled by the constant volume sampling method and analyzed by spectrometry and gas chromatography. The concentrations of hydrocarbons and carbon monoxide in the exhaust gases decreased significantly as the air-fuel ratio was increased from 10 to 20, while that of nitrogen oxides increased. At standard conditions without acceleration, the concentrations of HC and CO decreased 4% and 11%, respectively, while that of NOx increased 6%. The HC and CO concentrations decreased further, 24% and 47.3% respectively, as the total car weight was reduced 30%, while the NOx concentration increased 17.7%. At 0.10 PS/kg output ratio, HC and CO decreased 13.8% and 22% while NOx had no noticeable change from standard conditions. At 0.05 PS/kg output ratio, HC, CO, and NOx increased 10.9%, 31% and 7.3%, respectively. The exhaust gas concentrations of the 4-cycle car were satisfactory according to the U. S. federal automotive emission control act.

38894 **APTIC NO. 62631**

Bergt, W., G. Kappler, and G. Meikis

EXHAUST EMISSION MEASUREMENTS ON THE GE T64-7 TURBOPROP-ENGINE. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 15-1-15-4. 2 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The mass emission of carbon monoxide, unburned hydrocarbons, and nitrogen oxides was determined in the GE T64-7 engine at different power ratings. Although for aircraft engine application the operating modes were just recently issued in the Environmental Protection Agency proposed standards for control of air pollution, the engine was run through a 13-point California Test Cycle as applicable to diesel engines for vehicles up to 6000 lb gross weight. The measurements were taken for three different types of fuel: JP4, diesel at 20 C, and diesel at 50 C. The emission levels of the pollutants were superimposed on the load time spectrum of the California Test Cycle. The levels are well below the most severe emission limits to be imposed on diesel engines so far. The lowest values of emission levels were obtained for JP4 fuel.

38895 **APTIC NO. 62223**

Boettner, E. A., G. L. Ball, and B. Weiss

COMBUSTION PRODUCTS FROM THE INCINERATION OF PLASTICS. (FINAL REPORT). *Michigan Univ., Ann Arbor, Mich., School of Public Health, Environmental and Industrial Health, Environmental Protection Agency Contract EP-00386, Rept. EPA-670/2-73-049, 154p., 1973. 39 refs.*

NTIS: PB-222 001

Analysis of the combustion products of plastics was undertaken for three reasons: to provide scientists and engineers with information needed to design incinerators in order to maximize their efficiency while minimizing maintenance and pollution; to identify products of incomplete combustion potentially recoverable for their fuel or crude chemical value; and to identify products of incomplete combustion which would be acutely toxic in an accidental fire. Plastics studied were polyvinyl chloride, polysulfone, polyurethanes, polyimide, Lopac (R), Barex (R), phenol formaldehyde, urea formaldehyde, polyethylene, polypropylene, polystyrene, polycarbonate, polyphenylene oxide, polyester, synthetic fabrics (Dacron (R), Orlon (R), nylon), and natural products (wood and wool). One- to three-gram samples were heated at a controlled rate from 5 to 50 C/min in the presence of a measured flow of air or air plus oxygen. By this method plastics were never completely combusted to carbon dioxide and water, but rather generated large numbers of gaseous and condensed products. Additional gaseous products included straight-chain saturated and unsaturated hydrocarbons through hexane, aromatic hydrocarbons, hydrogen chloride, sulfur dioxide, cyanides, ammonia, and oxides of nitrogen. Liquefied fractions produced by most plastics were complex mixtures of 10 to 50 compounds, including heterocyclic and polycyclic hydrocarbons. (Author abstract)

38896 **APTIC NO. 62638**

Borghi, Roland

THEORETICAL STUDY OF THE RESIDUAL EVOLUTION OF POLLUTING PRODUCTS IN TURBOJET EXHAUSTS. *(Etude Theorique de l evolution Residuelle des Produits Pollutants dans les Jets de Truboreacteurs). Text in French. North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 24-1-24-11. 14 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A theoretical study of the residual evolution of polluting products in turbojet exhausts is presented. Many studies are currently underway to predict and control the quantity of carbon monoxide and nitric oxide pollution products delivered at the outlet of a turbojet nozzle. These quantities should not be directly taken into consideration to define the engine pollution rate, as noticeable evolutions take place in the jet outside the engine, either because chemical equilibrium has not been reached in the nozzle or because mixing of the burnt gases with external air modified, triggers or freezes reactions. A numerical computing method was established which takes into account turbulent mixing phenomena as well as non-equilibrium chemical reactions. A comparison was obtained between several reaction models, one of which takes account of the presence of hydrogen, oxygen, hydroxide, and nitrogen radicals, and on the other hand, the proof that carbon monoxide can be effectively transformed into carbon dioxide quite quickly after exhaust, while it is much more difficult for NO to disappear. (Author summary modified)

38897 **APTIC NO. 62629**

Bruton, D. M.

POLLUTION LEVELS AT LONDON (HEATHROW) AIRPORT AND METHODS FOR REDUCING THEM. *North Atlantic Treaty Organization, Neuilly sur Seine*

(France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 13-1-13-6. 1 ref. (April 9-13.)

NTIS, DDC: AD-769 278

Studies on pollution levels at London (Heathrow) Airport and methods of reducing them are discussed. Information on exhaust fume pollution levels is available from a study carried out by the Warren Spring Lab. in 1970-1971. Additional studies have been made by the Air Corp. Joint Medical Service for the situation in buildings. While pollution levels are below those of many urban areas and do not appear to represent either a short- or long-term hazard to health, local pollution problems constitute a source of annoyance to ground personnel employed at the airport. In an effort to alleviate some of the problems, the Air Corp. Joint Medical Service promoted a British European Aircraft Working Group to study the factors involved and propose possible solutions. Reductions of exhaust fume emission by vehicle selection, engine tuning, and maintenance and other techniques are described. (Author abstract modified)

38898 **APTIC NO. 62036**

Chilton, Cecil H. and Robert M. Jimeson

A NATIONAL ENERGY MODEL. *Battelle Memorial Inst. Columbus, Ohio, Columbus Lab. and Environmental Protection Agency, Washington, D. C., Office of Air Programs, Office of Air Programs Contract CPA 22-69-159, 31p., 1973. 3 refs. (Presented at the Sociedad Mexicana de Ingenieria de Costos, National Cost Engineering Congress, 2nd, and International Cost Engineering Symposium, 1st, Mexico City, Mexico, Oct. 29-Nov. 1, 1972.)*

A computer model for simulating supply, demand, cost, and distribution for fossil fuels of various sulfur contents delivered to various air quality regions has been developed. Output of the model is comprised of a fuel price schedule for each grade of fuel is each region; a fuel use schedule (including nuclear) showing the amount of each grade of fuel used in each region; a supply schedule showing the amount of each grade of fuel shipped from each supply district to each use region; and a control schedule showing the degree to which each region uses stack gas controls and/or low sulfur fuels. The response of fuel supply, demand, and prices to postulated air quality requirements is presented. (Author abstract)

38899 **APTIC NO. 62698**

Dimouro, Paul, Ron Reiner, and Hal Dodds

DEVELOPMENT AND FABRICATION OF A MASS EMISSION DATA AND CONTROL SYSTEM FOR THE STATIONARY SOURCE SIMULATOR. *Systems Technology Associates, Falls Church, Va., Environmental Protection Agency Contract 68-02-0658, Program Element 1A1010, Rept. EPA-650/2-73-009, 166p., Oct. 1973.*

NTIS: PB 232 013/AS

A mass emission data and control system was developed to provide the primary run time control and data acquisition functions for a large closed loop wind tunnel. The system is used to simulate the conditions found in smoke stacks of various industries but with carefully controlled conditions. Experiments conducted in the test sections of the source simulator can involve sampling, analytical equipment development or testing. The use of the monitoring, data handling, and control system relieves the operator and experimenter of the routine control and data acquisition functions. There are two classes of instrumentation, permanent and non-permanent. The permanent equipment is installed on the simulator to measure carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides, water, oxygen, temperature, and velocity. These inputs are used for control as well as general data and form the data base as to the actual conditions which exist in the simulator at any given time. The data system will automatically calibrate these instruments and record the data during the experiment.

38900 **APTIC NO. 62620**

Grobecker, Alan J.

UNITED STATES DEPARTMENT OF TRANSPORTATION RESEARCH PROGRAM FOR HIGH ALTITUDE POLLUTION. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 1-1-1-13. 10 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A Department of Transportation program to provide an assessment by 1974 of the impact on people, plants, and animals of climatic changes resulting from perturbing the upper atmosphere by the propulsion effluents of an international high altitude aircraft fleet as projected to 1990 is reviewed. Some physical considerations which must be taken into account are representations of the stratosphere in its unperturbed state, effluents of vehicles expected in 1990, the perturbed stratosphere of 1990, the perturbed troposphere of 1990 and 2020, effects of climatic changes on the biosphere, and social and economic measures of these biological effects. (Author abstract modified)

38901 **APTIC NO. 62647**

Henderson, Robert E. and William S. Blazowski

AIRCRAFT GAS TURBINE POLLUTANT LIMITATIONS ORIENTED TOWARD MINIMUM EFFECT ON ENGINE PERFORMANCE. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 33-1-33-13. 12 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The proposed Environmental Protection Agency regulations for aircraft engine emissions are examined in terms of their impact on the application to military aircraft gas turbine engines. A quantitative assessment of current engine emission levels, design trends, and potential emission control techniques is presented for carbon monoxide, total hydrocarbons, nitrogen oxides, and visible smoke. Total hydrocarbons can be further organized into unreactive hydrocarbons and reactive hydrocarbons or even finer subgroups. Total particulates must be considered along with the visible smoke. Sulfur oxides, although not a significant problem because of the low levels present in aviation fuels, can be considered as one of the pollutants. Emissions responsible for odor, although part of the total hydrocarbon class, can be considered separately. Special considerations must be afforded to military aircraft relative to direction application of EPA regulations. Many future emission reducing advances will be applicable to military gas turbines. Air Force goals have been established to insure that new engines take advantage of this technology, and are in accordance, to the greatest degree possible, with EPA requirements for commercial aircraft. These goals are in terms of minimum idle combustion inefficiency, maximum allowable oxides of nitrogen, and maximum allowable smoke number. (Author summary modified)

38902 **APTIC NO. 61671**

Hirst, Eric

ENERGY IMPLICATIONS OF SEVERAL ENVIRONMENTAL QUALITY STRATEGIES. *Atomic Energy Commission, Oak Ridge, Tenn., Oak Ridge National Lab., ORNL-National Science Foundation Interagency Agreement AEC 40-237-70 and NSF AG 398, Rept. Environmental Program ORNL-NSF-53, 34p., July 1973. 49 refs.*

Energy requirements and savings are examined for several environmental protection strategies, including the area of air pollution. Estimates of the fuel penalty for automobiles (relative to uncontrolled, pre-1968 vehicles) imposed by 1976 standards range from about 15-30%. The primary energy requirement for 90% efficeint particulate and 70% efficient sulfur removal at stationary sources contributing to air polluton is an estimated 560 trillion Btu for the year 1970. The energy estimates required to meet environmental needs, based on limitations and assumptions of the study, are small relative to total energy use.

38903 **APTIC NO. 62664**

Ingalls, Melvin N.

BASELINE EMISSIONS ON 6000 TO 14,000 POUNDS GROSS VEHICLE WEIGHT TRUCKS (FINAL REPORT). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-01-0467, Rept. APTD-1571. 184p., June 1973. 7 refs.*

Results are presented from laboratory exhaust and evaporative emission tests of 50 trucks (model years 1965-1973, gross vehicle weight 6000-16,000 lbs) using a modified light duty procedure. Topics covered in the report include: study objectives and approach; test facility, equipment, and procedure; test results; and conclusions. The results from these tests, together with other similar tests initiated by the Environmental Protection Agency, will form the baseline emissions data for this test procedure. The group of trucks which was assembled for these tests was sufficiently varied to contribute to a proper baseline. All trucks completed the test procedure successfully, although it appears that some adjustment in road load power settings may be required at dynamometer inertia settings above 8500 lbs. The emissions measured were hydrocarbons, carbon monoxide, carbon dioxide, and nitrogen oxides. (Author abstract modified)

38904 **APTIC NO. 62366**

Kaneko, Mikihiro

ON CYANIDE IN AIR. *(Taikichu no shian ni tsuite). Text in Japanese. Preprint, Japan Environmental Sanitation Center, Kawasaki, P. 75-76, 1973. (Presented at the National Meeting on Environmental Sanitation, 17th, Nagoya, Japan, Oct. 18-19, 1973, Paper 1.)*

Using the newly developed ion electrode method which is much more effective than the conventional pyridine pyrazoline method, the cyanide removal efficiency of a catalytic converter, the concentration of cyanide in exhaust gas that varies with the driving modes, the varying cyanide concentrations in the stack gases from refuse incinerators or boilers, and the atmospheric cyanide concentration around inter sections and coke furnaces were measured. The method used to determine cyanide content in the combustion gases is first outlined. The cyanide content of the automotive exhaust gas as determined by the ion electode method was 2.6 mg/cu m at the idling mode, 6.5 mg/cu m at 40 km/hr, 12 mg/cu m at 60 km/hr, and 18 mg/cu m at 80 mg/hr. The catalytic converter gave a cyanide removal efficiency ranging from 50 to 90%. The cyanide concentration in the stack gas from refuse incinerators was 5.6-9.5 mg/cu m under an imperfect combustion condition, and it was reduced to 0.3-1.3 mg/cu m under perfect combustion. There was no cyanide detected (0.025 mg/cu m or lower) in the stack of general boiler or hot air furnace. No detectable concentration of cyanide was observed in the atmosphere at and around intersections and around coke furnaces. Compred to the labor sanitation standard of 10 ppm (11.6 mg/cu m) for atmospheric cyanide, this non-detectable value (0.025 gm/cu m or lower) poses no problem to the living environment.

38905 **APTIC NO. 62409**

Kawamoto, Chuhei and Yasuhiko Yamada

SOME PROBLEMS OF THE URBAN PUBLIC NUISANCE OF THE CITIES IN RIKUCHU COAST AND THE STRUCTURE OF THE CITIES. *(Rikuchu kaigan rinkai toshi no toshi kogai to toshi no chiiki kozo ni kansuru shomondai). Text in Japanese. Tohoku Chiri (Ann. Tohoku Geogr. Assoc.), 25(3):111-116, 1973. 7 refs.*

Since the Rikuchu Coast (the central part of the Pacific Coast in northeastern Japan) is a Rias coast, the damage in the case of a seismic sea wave is great. Therefore, land for urban development is limited, urban institutions are densely arranged, and there is little rationality in the arrangement. Therefore, public nuisances such as air and water pollution occur. The coastal cities in Rikuchu are small scale cities with populations from 30,000 to 70,000. There is a lack of balance between city population and urban building, which also causes public nuisances. These cities are industrial fishing bases, and often have marine product processing plants. The sea water is polluted by the drainage from these plants. The atmosphere of the coastal cities is becoming polluted by smoke and dust from the marine product processing plants and from the haphazard urban growth.

38906 **APTIC NO. 62627**

Keddie, A. W. C., J. Parker, and G. H. Roberts

RELATIVE AIR POLLUTION EMISSIONS FROM AN AIRPORT IN THE UK AND NEIGHBOURING URBAN AREAS. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 9-1-9-9. 10 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Air pollution levels at Stansted Airport are discussed in relation to emissions from four nearby towns. With the exception of the hydrocarbons, total emissions from the airport are about the same as or less than the total emissions from Elsenham, the second smallest of the four sites. The airport total hydrocarbon emissions (98% of which come from aircraft operations) amount to about 60% of the approximated road traffic emissions of this pollutant in Bishop s Stortford, the largest of the four urban areas. On the basis of an emission rate per square km of urban or airport area, the airport hydrocarbon emissions are some 2.5 times the Bishop s Stortford emissions. With the exception of hydrocarbons, and to a lesser extent carbon monoxide, the airport contributions were relatively small in comparison with the other sources. Even in the case of hydrocarbons, the calculated typical contribution to concentrations at the central site were at least an order of magnitude less than the typical hydrocarbon concentrations in a polluted atmosphere. No attempt has been made to assess the effect on odors.

38907 **APTIC NO. 62669**

Liljedahl, Douglas R.

A STUDY OF EMISSIONS FROM LIGHT DUTY VEHICLES IN DENVER, HOUSTON AND CHICAGO. FISCAL YEAR 1972. *Automotive Testing Labs., Inc., Aurora, Colo., Environmental Protection Agency Contract 68-01-0455, Rept. APTD-1504, 182p., July 1973.*

NTIS: PB 232115/AS

Results are presented from a laboratory study of emissions from light duty vehicles (1966-1972 model years) operating in Denver, Houston, and Chicago. Exhaust emission tests for hydrocarbons, carbon monoxide, carbon dioxide, and nitrogen oxides were conducted according to the 1975 Federal Test Procedures on vehicles as received, while evaporative emission tests were conducted using a modified version of the Society of Automotive Engineers, SAE J171 SHED procedure. Topics covered in the report include: program objectives; program design; test vehicle procurement; facilities and equipment; equipment qualification, calibration, and cross-check; test procedures; data handling; and test results. Hydrocarbon and CO emissions tended to decrease in the more current model years, while CO2 and NOx emissions tended to increase. Exhaust hydrocarbon and CO emissions were significantly higher in Denver, a high altitude city, than in the other two cities; while NOx emissions were significantly lower in Denver. (Author abstract modified)

38908 **APTIC NO. 60281**

Mitra, S. K.

SOURCES CHARACTERISTICS OF LIQUID AND GASEOUS EFFLUENTS FROM FERTILISER PLANT. *Indian J. Environ. Health, 15(4):322-328, Oct. 1973.*

Air pollutants, liquid effluents, and solid wastes generated from operations in the fertilizer industry are reviewed in terms of their sources; physical and human health effects, and possible control measures. Air pollutants considered include: fall out particulates, suspended particulates, hydrocarbons, oxides of nitrogen, carbon monoxide, sulfur oxides, hydrogen sulfide, and hydrogen fluoride. Appropriate control strategies outlined include: the use of collectors, vapor recovery systems, byproduct recovery, combustion techniques, and stack gas scrubbing. Effects range from soiling of property and visibility reduction for particulates to plant damage and adverse human health effects for oxides of nitrogen.

38909 **APTIC NO. 62639**

Mosier, Stanley A., Richard Roberts, and Robert E. Henderson

DEVELOPMENT AND VERIFICATION OF AN ANALYTICAL MODEL FOR PREDICTING EMISSIONS FROM GAS TURBINE COMBUSTORS DURING LOW-POWER OPERATION. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 25-1-25-12. 22 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A theoretical combustor model was formulated for predicting concentrations and distributions of unburned hydrocarbons and carbon monoxide from gas turbine engine combustors. Essential components of this model include an internal flowfield model, a treatment of the physical combustion process, and a treatment of hydrocarbon oxidation kinetics. Model components were incorporated into a computer program with a single model structure for simplicity. An experimental program was also conducted to evaluate combustor design techniques for lowering emission levels and to provide experimental data against which the theoretical model could be tested. Burner exit plane measurements of unburned hydrocarbons, carbon monoxide, nitrogen oxides, temperature, and pressure were made. Predictions of exhaust species concentrations and distributions were made using the theoretical combustor model in support of the experimental program. The results are discussed with respect to internal aerodynamic and chemical kinetic arguments within the framework of the theoretical formulation. (Author summary modified)

38910 **APTIC NO. 61926**

Nishino, Shozo, Gunji Kawasaki, Hideichi Okumura, Itsuro Senda

EXHAUST GASES FROM HOT FORGING MILLS. 1. ANALYSIS OF EXHAUST GASES. *(Nekkan tanzo kojo no haishutsu gas ni tsuite. 1. Haishutsu gas seibun no bunseki). Text in Japanese. Toyama Kenritsu Otani Gijutsu Tankidaigaku Kenkyu Hokoku (Res. Rep. Toyama Prefect. Otani Junior Coll. Eng.), no. 5:112-118, 1973. 8 refs.*

The gas exhausted from a hot transfer press was collected with carbon tetrachloride or according to the method described in JIS K 2302. The CCl4 solution was separated from water in a separating funnel. The CCl4 solution was dried by the addition of anhydrous sodium sulfate. The solvent was then allowed to evaporate until the CCl4 solution became slightly colored. The IR spectrum of this solution in a 0.1 mm fixed cell showed an absorption band at 2962/cm, 1460/cm, and 1375/cm. The rate of transmission at 2962/cm was 57%. The samples collected by the JIS method also showed similar absorption. The hot forging oil, which is poured onto red hot ingots, evaporates without decompositon as an oil mist together with water vapor. The amount of oil mist discharged was 900-1100 mg/N cu m. The amount of water was about 12.5 g/M cu m. Only small amounts of aromatic hydrocarbons were present in the waste gas. Although about 1.31 wt% sulfur was present in the hot forging oil, no hydrogen sulfide was detected in the discharged gas. Little difference was noticed in the characteristics of the forging oil (c-k-2 hot forging oil supplied from Nippon Grease Co.) and the oil that condensed in the duct. For example, the temperature of the initial distillation was 97 and 100 C, respectively, and the resin content was 8.4 and 8.5%, respectively.

38911 **APTIC NO. 62055**

Palmer, Howard B. and Daniel J. Seery

CHEMISTRY OF POLLUTANT FORMATION IN FLAMES. *Ann. Rev. Phys. Chem., vol. 24:235-262, 1973. 204 refs.*

Recent literature on the chemical processes within combustion systems that give rise to their pollutants is examined. The sources of estimated man-made pollutant emissions include: transportation, fuel combustion in stationary sources, industrial sources, solid waste disposal, and miscellaneous. The main contributor to transportation is gasoline-powered vehicles. The principle industrial contributions to the sulfur dioxide, nitrogen oxides, and carbon monoxide (but not hydrocarbons or particulates) emissions arise from combustion processes. Incineration of refuse dominates the solid waste disposal category. The production of emissions from a device are affected by its design, operating conditions, history, and internal workings, including aerodynamics, transport phenomena, and chemical reactions. Even if a device produces pollutants they may be removed by absorption or precipitation befory they escape, or they may be minimized by modifying the device or its conditions of operation. The review concentrates on the reactions in flames that create the more obvious pollutants: NOx; sulfur oxides; CO; hydrocarbons, including partially oxidized species; and soot.

38912 **APTIC NO. 61035**

Popov, V. A.

ENVIRONMENTAL POLLUTION BY POLYCHLORINATED BIPHENYLS. *(O zagryaznenii okruzhayushchey sredy polikhlorirovannymi bifenilami). Gigiena i Sanit., 38(6):85-87, June 1973. Translated from Russian, 8p.*

A survey is made of pollution by polychlorinated biphenyls (PCB). The total world production of PCB is about 100,000 tons/yr. This compound can enter the environment from hermetically sealed and semihermetically sealed thermal electrical and hydraulic systems, leakage and losses during production, evaporation and leaching from devices, disposal of fluids containing PCB on dumps, and improper burning of rubbish in open dumps or in furnaces. The average yearly amount of PCB entering the air is 1500-2000 tons. The compound in the air is adsorbed by suspended particles and carried by the wind, which settle on the surface of the earth and oceans. The concentration of PCB in suspended particles in urban air is 50-80 ppm; most of the PCB is removed by precipitation in 2 to 3 days. The most likely half life in the soil is 5 years. The PCB can be found in organs and tissues of various animals, including man. Many countries have passed laws controlling the production, sale, emission, and levels of PCB. Rice contaminated with PCB caused an epidemic in Fukuoka Prefecture, Japan. In another episode, more than 2 million chickens in western Japan were affected by eating contaminated feed. Rapid absorption of PCB by the lung from the air and accumulation of PCB in the liver can occur. Within 24 hr, PCB disappears from the liver and accumulates in the fat and brain tissues. After 3 wk, 70% of the deposited PCB is still in the fatty tissues.

38913 **APTIC NO. 62636**

Sawyer, R. F., N. P. Cernansky, and A. K. Oppenheim

FACTORS CONTROLLING POLLUTANT EMISSIONS FROM GAS TURBINE ENGINES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 22-1-22-13. 31 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Factors controlling emissions of carbon monoxide, hydrocarbons, aldehydes, smoke, particulates, and nitric oxide from aircraft gas turbine engines are analyzed on the basis of aircraft engine exhaust composition and laboratory studies of gas turbine combustion processes. An analytical prediction of the effect of aircraft operating parameters on the emission of NO is given. Measurements of aircraft engine exhaust compositions from several different turbojet, turbofan, and turboprop engines reveal striking similarities in their pollutant emission characteristics. Carbon monoxide, hydrocarbons, and aldehydes are at their peak values during idle operation and drop to very low levels as engine power is increased. Particulates, smoke density, and NO increase with power level. The formation and destruction of these pollutants were investigated in a laboratory gas turbine combustor. The oxidation of CO, hydrocarbons, and aldehydes was measured in the dilution zone where thermal quench phenomena were observed. The apparent oxidation of particulates in the dilution zone was also observed. The formation of NO was observed in the primary zone and in the first part of the dilution section of the combustor. Operational conditions and engine parameters such as ambient temperature, pressure, and humidity, flight altitudes, flight Mach number, water injection, fuel properties, and combustor characteristics were studied analytically, yielding rational criteria for the prediction of their effect on the emission of NO. (Author summary modified)

38914 **APTIC NO. 62353**

Schaefer, Helmut

POWER ENGINEERING A MEANS FOR SHAPING OUR ENVIRONMENT AND FACTOR OF ENVIRONMENTAL POLLUTION. *(Die Energietechnik, Mittel der Umweltgestaltung und Faktor der Umweltbelastung). Text in German. Kerntechnik, 15(12):570-573, 1973.*

The primary energy demand in 1970 was about 20 times higher than the energy liberated by vulcanoes and hot springs, was one-sixth of the heat given off by the earth to the atmosphere, and reached the amount of solar energy transmitted to earth within 37 minutes. In West Germany, the primary energy consumption rises 4.5% per year, the consumption of converted primary energy by 4.6% annually. The conversion of energy pollutes the atmosphere with solid vaporous, and gaseous substances and with waste heat. The extent of the emissions depends on the fuel which is used, on the type of conversion process, on its efficiency, and on the mode of operation. The ecological effect of the use of energy in urban areas is shown by the example of Munich. The entire lead emission and almost the entire carbon monoxide emission in Munich stems from traffic. The emission of the oxides of nitrogen stem from traffic from households, small consumers, industries, power generation, and remote heat production. The dust emission comes to 46% from households and small consumers and to 20% from power generation. The sulfur dioxide emission, too, stems to a higher extent from households than from power plants. The latter emit 30% of the total SO2. For Munich, a thermal pollution of the atmosphere of about 10 kcal/sq m/hr, i.e., about 17% of the solar energy annually transmitted to earth has been determined. This quantity affects the microclimate noticeably, although it has probably no effect.

38915 **APTIC NO. 62197**

Schrodt, J. Thomas

AIR POLLUTION POTENTIAL OF THE INCINERATION PRODUCTS OF DISPOSABLE DIAPERS. (FINAL REPORT). *Kentucky Univ., Lexington, Dept. of Chemical Engineering, Proctor and Gamble Research Grant UKY TRSS-73-CMEI, 52p., July 1973. 27 refs.*

NTIS: PB 224 759

Gaseous and condensed liquid effluents from the incineration of three principal materials of a disposable diaper (Pampers) and fecal matter from an 18-month old boy were identified. The three materials studies were polyethylene, acrylic bonded nonwoven rayon fiber, and wood fiber padding. An infrared spectrophotometer and a gas chromatograph were used to identify and quantitatively analyze the effluents: carbon dioxide, carbon monoxide, water, methane, ethane, ethylene, acetylene, acetone, 1-butene, butane, benzene, toluene, methanol, formic, or acetic acid. All unidentified components were at levels of 5 mg/g of charged sample or less. Ash and unburned airborne particulates were recovered at levels of 6.5% or less of the original weight of the samples. Carbon dioxide, H2O, and CO were the only combustion products recovered at significant levels during the burns at high oxygen levels. The presence of significant levels of CO in the off gases was attributed to short contact time and inadequate oxygen availability for oxidation of CO to CO2. In municipal incinerators significant levels of CO are detected in the furnace outlet gases, however, after further exposure of these gases to O2 in the expansion chambers, the CO levels drop to negligible levels. Theoretically, when 3 lb of disposable diapers with normal deposits of infant feces are mixed with 1000 lb of domestic solid refuse and properly burned in a well designed incinerator operated at 1400 F or greater with 100% excess air, no alteration of the composition of the gaseous effluents or the grate ash should occur. The 1400 F and 100% excess air are minimum operating conditions for municipal incinerators. (Author abstract modified)

38916 **APTIC NO. 62451**

Sinha, J. K.

POLLUTION FROM CEMENT INDUSTRY. *J. Inst. Engrs. India (Calcutta), 54(1):25-35, Oct. 1973. 17 refs. (Presented at the Annual Paper Meeting, Hyderabad, India, Oct. 21, 1973.)*

The average dust loss from the cement kiln chimneys of 10 Indian cement factories was 9.75% of the clinker produced from the kilns. The dust discharged into the atmosphere amounts to 1.25 million tons. Out of 14 kilns investigated, only 3 had gas cleaning devices (2 cyclones and 1 electrostatic precipitator). The leakage of dust from the transporting ducts raises the airborne dust concentration at many working places in the factories. At several places, the fall of material from one conveyor to another or to a hopper was excessive. The design of chutes was not adequate, again raising the airborne dust concentration at several working places. Artificial or mechanical ventilation was insufficient, especially in closed areas of dusty operation. The average airborne dust concentration at the respective operations of limestone crushing, packing of cement in bags, loading of bags onto wagons, and coal crushing, drying, and milling were above the threshold limit value for the cement industry. The workers at these operations were exposed to dust above the threshold limit. The average airborne dust concentration at the kiln firing end, clinker cooler area, cement mill, general factory area, and general office area were within safe limits. The outside airborne dust concentration around the factories increased with distance for the first km and decreased. (Author summary modified)

38917 ***APTIC NO. 62294***

Skinner, Frank W., Louis Miller, and W. Harvey

PROTECTION OF THE ENVIRONMENT DURING DEMOLITION ACTIVITIES (FINAL REPORT). Army Engineer Waterways Experiment Station, Vicksburg, Miss., Weapons Effects Lab., Army Proj. 4A062103A891, Tasks 05-02, Work Unit 005, Miscellaneous Paper N-73-6, 60p., Dec. 1973. 42 refs.

NTIS, DDC: AD-772 920

The air pollution problems associated with demolition are described in a survey of demolition techniques. Dust is a problem common to almost every type of demolition project. It generally contributes to the total air pollution and is a health and safety hazard in the immediate work area. Haul roads for solid waste disposal can be a major source of dust. Simple procedures, as wetting down structures and roads, can greatly reduce dust loads. Covers placed over open bed trucks, particularly dump trucks, will reduce in-transit dust and also prevent debris from falling off the truck. Chemical or oil mixtures applied to roads and bare areas can also effectively control dust. Dust from drilling operations for explosive placement or hydraulic wedge placement can be effectively controlled by use of water or chemical dust control systems integral to the drilling equipment. Smoke is a most obvious contributor to air pollution. Laws prohibiting open burning have greatly alleviated this problem. Burning is permitted in some areas, provided appropriately designed incinerators or forced air, open pit furnaces are used.

38918 **APTIC NO. 61806**

Speich, Peter

FUTURE ASPECTS - ENERGY SUPPLY - ENVIRONMENT. *(Zukunftsaspekte - Energiedargebot - Umwelt). Text in German. Wasserwirtsch., 63(11/12):383-392, 1973. 15 refs.*

It is expected that the energy consumption of the Federal Republic of Germany will double until 1985. The additional demand is mainly met with fuel oil, gas, and atomic energy. The effects of increased energy demand on the environment and measures to reduce pollution are described. Several examples of improved utilization, possible savings, and new technology are described. Particulate emissions will have droped to half by 1980 due to efficient dust collection facilities. As a consequence of the increased use of nuclear power and gas, as well as of future flue gas and fuel desulfurization measures, the sulfur dioxide emission will not further increase but will specifically drop to about 54%. The waste heat emission due to the increasing use of fossil fuels will go up 20%. New low-polluting technologies are being developed with the purpose of further reducing emissions and saving energy. Deposits of solid fuels are still large enough so that presently the possibility of converting them into a less polluting form, e.g., gas, is being studied. In the power plant Luenen, pressure gasification of coal is being tested. Another method of producing a low-polluting fuel is the coal gasification in high-temperature reactors. The heat required for gasification is supplied by the reactor cooling agent helium. Another method uses nuclear heat for methane cracking in order to obtain hydrogen which is used for coal gasification. Several ways of reducing the heat emission such as heat exchangers and better heat insulation are reviewed. Using the Rhenish lignite field as an example, influence of the generation and conversion of energy on the environment and the shaping and design of the environment are discussed.

38919 **APTIC NO. 62462**

Suzuki, Sachio, Koji Mori, and Nobuo Fujii

ENVIRONMENTAL POLLUTION BY ARSENIC IN THE VICINITY OF A REFINERY. *(Bo seiren kojo shuhen no hiso ni yoru kankyu osen). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1): 111, April 1973.*

The degree of arsenic pollution in the vicinity of a refinery was studied by analyzing sample soils and hair of schoolchildren. The hair samples were taken from second grade boys from a nearby grade school in Feb. 1972. The soil samples were also collected in Feb. 1972. Samples of soil and hair from control areas were collected in October 1972. Arsenic quantitation was obtained by diethyl silver carbamine acid. The soi was burned by the wet method and directly analyzed. Th recovery rate was 97%. The hair samples were washed i. neutral detergent; by the wet burning method, recovery was 93%, and the dry burn recovery rate was 97%. The soil samples within 700 m from the plant had 76.3 to 2470 micrograms/g of dry material. The samples between 700-1500 r from the plant had 17.9 to 76.3 micrograms. In samples fro the construction site where the top soil had been removed, A concentration was 8.5 microgram within a 700 m area. In th control areas, As content ranged from 2.52 to 5.24 microgram The 54 samples of children s hair had a maximum of 12 micr grams/g dry material and a minimum of 0.05 micrograms. the control group, the maximum and minimum were 0.72 a 0.07 micrograms respectively.

38920 **APTIC NO. 6267**

Tataiah, K.

EXHAUST EMISSION CHARAC[illegible]RISTICS OF A MERCEDES 220D DIESEL ENGI[illegible] CAR. *Preprint, The Combustion Inst., Pittsburgh, Pa., 18p., 1973. 11 refs. (Presented at the Combustion Institute, Central States Section, Spring Meeting, Champaign, Ill., March 27-28, 1973.)*

The effects of fuel composition on the emission characteristics of an automotive diesel engine were evaluated by conducting tests on a 1972 Mercedes diesel car, Model 220D, using five different blends of diesel fuel. It has been reported that diesel engines equipped with precombustion chambers have the potential of meeting the 1975 Federal exhaust emission standards while retaining the high thermal efficiency and excellent fuel economy characteristics of this type of engine. The tested car met the 1975 emission limits (0.41 g/mi hydrocarbons, 3.4 g/mi carbon monoxide, and 3.0 g/mi nitrogen oxides); however, it failed to satisfy the 1976 NOx limit (0.4 g/mi). The emissions did not vary significantly with diesel fuel composition within the wide range of fuels tested. The particulate emissions from this car (0.5 g/mi) were about 25 times higher than those of 1972 gasoline fueled vehicles using nonleaded gasoline. Fuel economy of the car decreased linearly from 40 mpg at 30 mph to 23 mpg at 60 mph. (Author abstract modified)

38921 **APTIC NO. 62277**

Thayer, Scott D. and Jonathan D. Cook

VEHICLE BEHAVIOR IN AND AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME VI - MAJOR HIGHWAYS. (FINAL REPORT). *Geomet, Inc., Rockville, Md., Office of Air and Water Programs Contract 68-02-1094, Task Order 3, Rept. Environmental Protection Agency-450/3-74-003-f, 60p., Nov. 1973. 12 refs.*

NTIS: PB-231705/AS

A general methodology is presented for relating parameters of traffic behavior on major highways, including traffic volume and average speed. to more readily available characteristics of highways, including design speed and capacity. Such relationships are to be used to relate major highway characteristics to air quality. Both macro-analytic and micro-analytic approaches are used. Macro-analysis utilizes proportionate modelling to determine the impact of new facilities on the overall air quality of a designated area, while the micro approach utilizes diffusion modelling to predict pollutant concentrations and their detailed spatial distribution. (Author abstract modified)

38922 **APTIC NO. 62616**

Thayer, Scott D. and Kenneth Axetell, Jr.

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCE CHARACTERISTICS. VOLUME III - SPORTS STADIUMS (FINAL REPORT). *Geomet, Inc., Rockville, Md., Environmental Protection Agency Contract 68-02-1094, Task 3, Rept. EPA-450/3-74-003-c, 60p., Sept. 1973. 9 refs.*

NTIS: PB 231702/AS

A general methodology is presented for relating sports complex parameters to the associated traffic behavior to assess the impact of new sports complexes on air quality. Data are tabulated for: recently constructed major stadiums in the United States, seating capacities and parking at stadiums, off-street parking requirements for stadiums and arenas, vehicle exhaust emissions at idle in grams per minute, parameters for estimation of traffic volumes, area consumption per parking space, waiting times for exit from parking stalls, calculated and observed parking lot emptying times, and atmospheric stability categories.

38923 **APTIC NO. 62660**

Thayer, Scott D.

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME IV - PARKING FACILITIES (FINAL REPORT). *Geomet, Inc., Rockville, Md., Environmental Protection Agency Contract 68-02-1094, Task 3, Rept. EPA-450/3-74-003-d, 60p., Oct. 1973. 13 refs.*

NTIS: PB 231703/AS

A general methodology is presented for interpreting parameters which characterize parking facilities into descriptions of traffic behavior in and around the source and for studying the impact of new parking facilities on air quality. Information is tabulated for: suggested unit parking dimensions, area per car in lots employing customer-parking and those employing attendant-parking, vehicle exhaust emissions at idle in grams per minute, base running times by operating mode at two example parking garages, total use rates for two sizes of parking garage for differing conditions, and atmospheric stability categories.

38924 **APTIC NO. 62670**

Thayer, Scott D.

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCES CHARACTERISTICS. VOLUME VII. RECREATIONAL AREAS (FINAL REPORT). *Geomet, Inc., Rockville, Md., Environmental Protection Agency Contract 68-02-1094, Task 3, Rept. EPA-450/3-74-003-g, 71p., Nov. 1973. 17 refs.*

NTIS: PB 231706/AS

Results are reported from a study of vehicle behavior in and around recreational areas in an attempt to relate parameters descriptive of traffic behavior to descriptive characteristics of the complexes themselves and the resulting effects on air quality. Data are presented for such parameters as average monthly visitation pattern, load factors and average visits per day in peak visitation periods, hourly distribution by percent of total weekend trips to all state parks, and vehicle exhaust emissions at idle in grams per minute. Meteorological characteristics which most importantly affect atmospheric dilutive capacity are mixing height, wind speed, and atmospheric stability. The period when meteorological conditions are least favorable for diluting pollutants is the period when recreational areas are essentially not in use.

38925 **APTIC NO. 62012**

Yamate, George

DEVELOPMENT OF EMISSION FACTORS FOR ESTIMATING ATMOSPHERIC EMISSIONS FROM FOREST FIRES (FINAL REPORT). *IIT Research Inst., Chicago, Ill., Office of Air and Water Programs Contract 68-02-0641, Environmental Protection Agency 450/3-73-009, IITRI Project C6265, 148p., Oct. 1973. 19 refs.*

NTIS: PB-230 889/AS

Emission factors (weight of pollutant per acre burned) for estimating emissions from forest fires, especially wildfires, were developed for the five geographical forest areas in the country. The pollutants of interest were particulates (filterable and total), hydrocarbons (reactive or unreactive), carbon monoxide, nitrogen oxides, and sulfur oxides. The effects of terrain, density of vegetation coverage, type of vegetation, wind speed, and humidity were expressed as adjustment factors to the average emission factors. The following emission values or pollutant yields (in lbs/ton of fuel) were selected as representative of average forest fuels: total particulate-17, CO-140, total hydrocarbon as methane-24, NOx-4, and sulfur oxides as sulfur dioxide-neg. A complete summary of the wildfire emission data by geographical subdivision is shown in table form. It shows acres consumed by wildfires in 1971, wildfire fuel consumption, emission factors for particulates, CO hydrocarbons, and NOx, and emissions from 1971. (Author abstract modified)

38926 **APTIC NO. 61676**

Organisation for Economic Co-operation and Development, Paris (France) Air Management Sector Group and Energy and Oil Committees

REPORT AND CONCLUSIONS OF THE JOINT AD HOC GROUP ON AIR POLLUTION FROM FUEL COMBUSTION IN STATIONARY SOURCES. *217p., 1973. 9 refs.*

On the basis of estimated fuel demands for O. E. C. D. countries (Belgium, France, Germany, Ireland, Luxembourg, Netherlands, United Kingdom, Greece, Italy, Portugal, Spain, Turkey, Denmark, Finland, Norway, Sweden, Canada, United States, Austria, Switzerland, and Japan), without implementation of abatement procedures other than those already planned, projected emissions of sulfur oxides and nitrogen oxides are expected almost to double during the period 1968 to 1980. For particulates, an overall increase is projected, although less than that for the other two pollutants. During the next decade energy demand in O. E. C.D. countries will continue overwhelmingly to be met by the use of fossil fuels. Control techniques for pollutants will need to be developed, demonstrated, and utilized to a sufficiently wide extent before 1980 to have a meaningful impact on the future situation. These techniques include fuel and stack gas desulfurization, nitrogen oxide control combustion techniques, fuel substitution, and further advanced particulate control equipment. For each pollutant both the fuel and technological requirements are discussed in relation to abatement strategies. Emission factors are calculated. The total costs of implementing abatement strategies are discussed. Other matters considered are dispersion of abatement, waste disposal, fuel management, energy policy, and legislation.

38927 **APTIC NO. 61888**

Tokyo Metropolitan Environmental Protection Research Institute

EXAMINATION AND RESULT OF POLLUTANT MEASUREMENTS IN SANITATION PLANT STACK GAS. *(Seiso kojo ni okeru haienchu no osenbusshitsu sokutei no kento oyobi kekka ni tsuite). Text in Japanese. Kogai Kenkyusho Shiryo (Environmental Protection Research Institute Data), Dec. 1973. 56p.*

Air pollutants in flue gas from the Chitose sanitary plant in the Setagaya ward were analyzed from 1971 through 1973. The sanitary plant has two incinerators with a total capacity of 600 tons/day and a total emission of 132,000 N cu m/hr. The average hydrogen chloride concentration obtained by the silver nitrate method from 19 samples was 740 ppm and that by the conductivity method from 25 samples was 810 ppm. The average sulfur dioxide concentration measured by the Arusenazo III method from 15 samples was 45 ppm whereas that by the infrared method for 204 hours was 35 ppm. The average nitrogen oxide concentrations by the chemiluminescent method, improved Saltzman method, IR, and PDS method were 157 ppm, 158 ppm, 137 ppm, and 130 ppm, respectively. The average particulate concentration was 0.02 g/N cu m while the highest concentration was more than 0.2 g/N cu m. The hydrocarbon concentration was mostly about 2 ppm, but exceeded 50 ppm when furnace temperature was suddenly raised. Hydrogen cyanide concentration was found to be lower than 0.1 ppm.

38928 **APTIC NO. 62081**

Organisation for Economic Co-operation and Development, Paris (France) Environment Directorate

REPORT AND CONCLUSIONS OF THE JOINT AD HOC GROUP ON AIR POLLUTION FROM FUEL COMBUSTION IN STATIONARY SOURCES. *236p., 1973. 9 refs.*

An international assessment is made of the air pollution situation in terms of emissions of specific pollutants from different types of fuels burned for different sectors of use and of the presently available technology and the costs of controlling these emissions. Projected emissions of sulfur oxides and nitrogen oxides are expected almost to double during the period 1968 to 1980. The abatement strategies proposed by individual countries are in part formulated on the availability of the quantities and qualities of the fuels required to meet the anticipated 1980 demands. Control techniques for pollutants will need to be developed, demonstrated, and utilized to a sufficiently wide extent before 1980 to have a meaningful impact on the future situation. These techniques include oil desulfurization processes, flue gas cleaning, coal desulfurization, nitrogen oxide control combustion techniques, and further advanced particulate control equipment. The total costs of implementing abatement strategies include the direct costs to the industries concerned in additional plant investment and operations, the costs to domestic and commercial fuel users in increased fuel prices, and the economic consequences of the resulting increased demand for capital.

38929 **APTIC NO. 62085**

Federal Power Commission, Washington, D. C., Bureau of Power

STEAM-ELECTRIC PLANT AIR AND WATER QUALITY CONTROL DATA FOR THE YEAR ENDED DECEMBER 31, 1969, BASED ON FPC FORM NO. 67. (SUMMARY REPORT). *Rept. FPC-S-229, 228p., Feb. 1973. 6 refs.*

GPO

Air polluting emissions from 654 steam electric plants are tabulated for the year ending Dec. 31, 1969. The regional distribution of air pollutant emissions was almost directly proportional to the levels of coal consumption. The total emission levels are in basic agreement with National Air Pollution Control Administration figures for the year 1968 of 5.6 million tons of particulate emissions, 16.8 million tons of sulfur dioxide emissions, and 4.0 million tons of nitrogen oxide emissions. In 1969 steam electric plants reported total air quality control expenses at $59.6 million, or on a national basis, 0.052 mills/kw hr. Of the total expenses, $39.8 million was spent on ash collection and disposal. In 1969, coal-fired units generated 706 billion kw-hr. The ash collection and disposal expenses amounted to 0.05 mills/kw-hr generated in coal fired units. Assuming fixed charges of 15% on the capital costs, the total particulate control expenses/hr woud amount to 0.14 mills/kw-hr generated in coal fired units. Expenditures for direct sulfur oxide and nitrogen oxide control were insignificant. (Author summary modified)

38930 **APTIC NO. 62198**

National Research Council of Canada, Ottawa (Ontario), Associate Committee on Scientific Criteria for Environmental Quality

LEAD IN THE CANADIAN ENVIRONMENT. *Rept. BY73-7(ES), NRCC 13682, 116p., Dec. 1973. 179 refs.*

A complete study of the sources of lead in the Canadian environment is presented. Chapters are included on historical and background information on lead, the release of lead into the Canadian environment, current lead levels in the Canadian environment, lead in vegetation, toxicity of lead to aquatic life, lead in wildlife, lead in domestic and laboratory animals, human lead intake from all sources, and lead in man. Lead in air results from human activities such as primary and secondary Pb smelting, burning of gasoline containing anti-knock agents, combustion of coal, storage battery manufacture, pigment production, and radioactive decay. A sampling was made of Pb in the air at 38 sites in 20 industrial cities in 1971. The lowest annual geometric mean was 0.25 micrograms/cu m and the highest was 1.35 micrograms/cu m, with most near 1 microgram/cu m. The concentration of Pb in air about 1.2 m above the curbside of heavily trafficked streets in cities was sampled over 3 hr periods. Concentrations ranged from 0.4 to 22.3 micrograms/Pb/cu m. Factors affecting the concentrations were traffic density, time of day, day of week, and weather. The overall Pb values for the period from 6-21 hr were 8.2, 8.4, and 4.0 micrograms/cu m in Vancouver, Toronto, and Montreal (3 m from curb), respectively.

38931 **APTIC NO. 62221**

Vollmer Associates

ENVIRONMENTAL/SECTION 4(F) STATEMENT: ADMINISTRATIVE ACTION FOR CONSTRUCTION OF INTERSTATE ROUTE 291 FROM THE INTERCHANGE WITH I-84 IN THE TOWN OF FARMINGTON NORTHERLY AND EASTERLY TO AN INTERCHANGE WITH I-91 IN THE TOWN OF WINDSOR. *Dept. of Transportation, Washington, D. C., Federal Highway Administration, 131p., 1973. 42 ref*

A recommended route and some alternates are presented for the highway Interstate-291. Special consideration is given to the impact this highway will have in the Hartford area. Extensive data on motor vehicle emissions have been reviewed. They lead to projected figures for pollution from I-291 given as follows in lbs/mi-vehicle for 1975: carbon monoxide, .08; hydrocarbons, .01; nitrogen oxides, .018; and airborne lead, .00011. These pollutants will be emitted in the immediate area of I-291 at rates directly proportional to the flow of cars per unit time. They will be diluted as they mix with air under the meteorological conditions which will vary widely from hour to hour and from season to season. Expressways similar to I-291, carrying in some cases several times the anticipated traffic load, are already in operation. Actual measurements in the immediate area indicate 2-8 ppm CO which is considered tolerable by government standards for at least limited exposure. By analogy with other studies, lead concentrations would not be expected to exceed 10 micrograms/cu m, which again is considered below the toxicity level. These emissions will be superimposed on the existing pollution load which at times currently exceeds acceptable limits in the downtown Hartford area. Control measures now being introduced coupled with reduced auto emissions projected by 1975 are expected to control this problem. Route I-291 does not seem to pose any special new toxicity threat to the Greater Hartford area. Emission factors are calculated for emissions by gasoline and diesel engines. Lead gasoline additives were studied from their emission to the atmosphere, dispersion by meteorology and eventual deposition into the reservoir. The incremental value is substantially below medically accepted concentrations for lead in drinking water.

38932 **APTIC NO. 62280**

Organisation for Economic Co-operation and Development, Paris (France), Environment and Industry Committees

POLLUTION BY THE PULP AND PAPER INDUSTRY. PRESENT SITUATION AND TRENDS. *270p., 1973.*

Air pollution by the pulp and paper industry is included in an international study of pollution including present situation and predicted trends, legislation and regulations, pollution control technology, pollution control costs, and the economic and financial aspects. The problems of air pollution concern mainly the emission of particulate matter, sulfur dioxide, and odorous compounds of sulfur as hydrogen sulfide and various mercaptans. Apart from emissions of SO2 and particulate matter from combustion plants, the emissions specific to the pulp and paper industry are particularly the odorous gases emitted during manufacture of sulfate pulp and SO2 from the calcium based sulfite process. These problems of air pollution are quickly detected by the general public, but they are usually restricted to the neighborhood of the mill. They add, however, to the general problem of atmospheric pollution by S, which may have serious ecological effects in certain countries.

38933 **APTIC NO. 62332**

Air Force Cambridge Research Labs., Bedford, Mass.

ENVIRONMENTAL IMPACT OF B-1 EMISSIONS IN THE STRATOSPHERE. *Proj. 86050801, 61102F, AFCRL-TR-73-0608, AFSG 275, 35p., Oct. 1973. 29 refs.*

NTIS, DDC: AD-770 016

The environmental impact of B-1 emissions in the stratosphere were assessed and include local and global changes in the weather, ultraviolet radiation, and stratospheric ozone concentrations. The fleet is to consist of 241 aircraft flying a total of 650 hr/yr in the stratosphere. The B-1 will be powered by four F101-GE-100 augmented turbofan engines. The emissions in million tons/yr are 0.078 for water, 0.21 for carbon dioxide, 0.000065 for hydrocarbons, 0.0005 for nitric oxide, 0.00006 for sulfur dioxide, 0.000004 for particulates, and 0.0004 for carbon monoxide. There is little likelihood of any long term global impact on the climate as a consequence of B-1 operations, though there might be some small, transient local weather effects.

38934 **APTIC NO. 62617**

International Business Machines Corp., Gaithersburg, Md., Federal Systems Div.

COMPREHENSIVE DATA HANDLING SYSTEM (CDHS), EMISSIONS INVENTORY SUBSYSTEM PROGRAM DOCUMENTATION (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0638, Rept. APTD-1551, 177p., July 1973.*

NTIS: 231839/AS

Program documentation is presented for the Emission Inventory Subsystem of the Comprehensive Data Handling System to provide a more detailed knowledge of the system s programming logic. Elements of the documentation include: an overview of the system with a brief functional description of each component program comprising the system and a detailed discussion of the system master file and the general transaction cards required to build the master file; file maintenance and retrieval; output programs; data conversion programs; and emission factors table programs. Each program in the EIS system is organized in the top-down manner in which higher level programming modules execute one or more lower level modules to perform specific functional tasks.

38935 **APTIC NO. 62665**

Automotive Environmental Systems, Inc., Westminster, Calif.

A STUDY OF BASELINE EMISSIONS ON 6000 - 14,000 POUND GROSS VEHICLE WEIGHT TRUCKS (FINAL REPORT). *Environmental Protection Agency Contract 68-01-0468, Rept. APTD-1572, 2060, 156p., June 1973.*

NTIS: PB 232037/AS

Results are reported from an exhaust and evaporative emissions study in the Los Angeles area designed to determine the contribution of 3-7 ton gross vehicle weight trucks to air pollution and to assess the feasibility of using light-duty vehicle emission test procedures in future surveillance and compliance programs for such vehicles. Mean baseline emission levels for 50 vehicles tested were: hydrocarbons, 6.87 g/mi; carbon monoxide, 84.83 g/mi; carbon dioxide, 746.1 g/mi; nitrogen oxides, 7.37 g/mi; and evaporative hydrocarbon emissions, 2.43 g/mi. Light duty vehicle test procedures appeared to be feasible for medium duty vehicles as no difficulty was encountered in performing the tests. Topics covered in the report include: program objective, vehicle procurement, test procedures, data handling, and test results. (Author abstract modified)

38936 **APTIC NO. 62699**

GCA Corp., Bedford, Mass., GCA Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS OF PHOSPHORUS (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0601, Program Element 2AE132, Rept. EPA-450/3-74- 013, 54p., May 1973. 45 refs.*

NTIS: PB 231670/AS

Results from a national inventory of the sources and emissions of the element phosphorus are presented as part of an effort to define the levels, nature, and sources of phosphorus-containing emissions for defined geographic regions throughout the United States. Emission data are tabulated for such phosphorus industry sources as triple superphosphate, ammonium phosphate, normal superphosphate, fertilizer application, rock processing, and elemental phosphorus, as well as inadvertent sources such as coal combustion and iron manufacturing. The principal source category of phosphorus containing emissions is the fertilizer manufacturing industry which contributes an estimated 82% of the emissions generated. Triple superphosphate and ammonium phosphate plants are the largest source categories, contributing 35,700 and 30,700 tons/year, respectively. The overall level of control of phosphorus-containing emissions for the 1970 inventory year is estimated to have been about 87%. A method is recommended for updating the results of the study every two years.

1972

38937 **APTIC NO. 50627**

MSA Research Corp., Evans City, Pa.

HYDROCARBON POLLUTANT SYSTEMS STUDY. VOLUME I - STATIONARY SOURCES, EFFECTS, AND CONTROL. (FINAL TECHNICAL REPORT). *Office of Air Programs Contract EHSD 71-12, MSAR 72-233, AC-860, Pub-APTD-1499, 380p., Oct. 20, 1972. 545 refs.*

NTIS: PB 219073

Results and conclusions of the hydrocarbon pollutant systems study are presented. The study consisted of identification, characterization, and ranking of all significant stationary sources of hydrocarbon emissions; the characterization of the effluent streams from the major sources of hydrocarbon emissions; the technical and economic evaluation of existing and developable control technology; and the development of priorities and recommendations for a program that will ultimately lead to proven control hardware and technology. A general review of the literature on human health, hazards, photochemical reactivity, and vegetation damage was done to determine the ranking of pollutants and their sources. The major sources of hydrocarbon emissions were fuel combustion, solid waste combustion, solvent evaporation, petroleum refining and marketing, and chemical processing. The state-of-the-art of current control technology was reviewed; deficiencies in existing techniques were identified, and specific studies of wet scrubbing design and correlation were presented. A procedure for correlation of particulate removal performance of wet scrubbing devices was developed. Major areas recommended for further research and development included the improvement of monitoring techniques and instrumentation to provide continuous and chemically specific emission analysis; continuing chronic toxicity and epidemiological studies to determine health effects; and the correction of deficiencies in current control technology.

38938 **APTIC NO. 61980**

Armstrong, G.

COAL--THE WORLD S MAJOR FOSSIL FUEL. *Preprint, British Assoc. for the Advancement of Science, 15p., 1972. 6 refs. (Presented at the British Association for the Advancement of Science, Annual Meeting, Leicester, England, Sept. 6, 1972.)*

World coal resources are reviewed. The bulk of the economically important reserves are the Carboniferous period coals of Europe and North America, the Permian age reserves in the Southern Hemisphere and India, and Cretaceous reserves in the U. S. and Canada. The rank of coal depends on the degree of metamorphosis of vegetable matter caused by burial beneath younger sediments, the local geothermal gradient, and tectonic effects. Sulfur in coal varies from 1/2 to 5% or more. Since it is a cause of atmospheric pollution, sulfur is an undesirable constituent. The average sulfur content of coals currently worked in Great Britain is about 1.7%, but many countries are endowed with a greater proportion of lower-sulfur coals. The age of the coal resources of the world, the interrelationship of coal classification systems used in great Britain, Europe, and North America, estimates of coal reserves, National Coal Board classification of reserves, and world coal reserves are discussed. It may be necessary to double the present coal output by 1985 in the U. S. to support only 20% of the country s energy needs. Increased exploration for new reserves and increased research on coal utilization and gasification will be needed to meet coal demand in the future. With adequate prior geological investigation and exploration, the coal deposits of North America could support increased production for many decades. The main impediments to massive expansion are not wholly related to geology, but to the availability of labor, the conservation lobby, and to the reluctance on the part of investors to deploy capital on projects which, at least initially, will yield a low return. However, most countries are not exploring coal reserves rapidly or even preserving the capacity of the coal industries at even their present levels, since they show little sense of urgency regarding the possibility of an energy crisis in the 1980s or their dependence on Middle East oil.

38939 **APTIC NO. 60325**

Berwager, Sydney D. and George V. Wickstrom

ESTIMATING AUTO EMISSIONS OF ALTERNATIVE TRANSPORTATION SYSTEMS. *Metropolitan Washington Council of Governments, Washington, D. C., Dept. of Transportation Contract DOT-OS-20004, Rept. DOT-OS-20004, 87p., April 1972. 6 refs.*

NTIS: PB 208914

The development and application of a model to estimate the magnitudes of carbon monoxide, hydrocarbons, and oxides of nitrogen for alternative transportation systems are presented. The model consisted of three distinct phases: an auto vehicle trip origin sub-model, a sub-model which produced forecasts of auto travel characteristics, and an emission level estimator which produced estimates of the subarea level. Computation of auto emissions was accomplished by means of a computer program. Utilization was made of 48 subareas and 11 aggregation units, (counties, states, and regions) in application of the model to the Washington, D. C. Metropolitan area. Emissions calculations for this area indicated that substantial reductions in CO, HC, and NOx would occur even in the face of an estimated future increase of over 6,000,000 vehicle-miles of travel by 1976 via effectively meeting the 1975 vehicle emission standards. The largest additional reduction due to transportation system alternatives would be brought about by construction of the full 98 mi rail rapid transit system. Little or no regional variation was found in the levels of CO or HC emissions with transit supply held constant as a result of the alternative highway systems examined. Increased travel was generally offset by the higher speeds of travel made possible by an expanded freeway system. (Author summary modified)

38940 **APTIC NO. 61982**

Condren, Arthur J., Robert F. Dawson, and William J. Jewell

MINIMIZATION OF AIR POLLUTION AT NEW YORK S LAGUARDIA AIRPORT. *Rhode Island Univ., Coll. of Engineering and Greater Providence Chamber of Commerce, Proc. Northeast. Reg. Antipollut. Conf., 5th, Annu., Kingston, R. I., p. 20-33. 2 refs. (July 17-20.)*

Airport pollution is due to aircraft take-offs and landings and to the self-propelled movement of aircraft between the docking areas and the runways. Little effort has been undertaken to evaluate the second operation as a major source of air pollution, yet during self-propelled ground movement of a typical commercial jet, each engine consumes 17 lbs/min fuel. A Boeing 707 delayed on a taxi- way for 1 hr would consume 4000 lbs of fuel during idling mode which produces 10 times more hydrocarbons than cruise mode. The magnitude of this problem at New York s LaGuardia aiport was determined. About 65.4% of the commercial aircraft were scheduled to depart during 1/3 the available time, this led to stack-ups. The calculated cumulative daily delay time for the 376 scheduled commercial aircraft was 1156 min. The largest delay to a single aircraft was 15.5 min. If there was any failure of any traffic system, the time interval between take-offs would increase from 1.5 to 2.5 min, increasing the cumulative delay time by a factor of 12 to 13,942 min/day. The longest delay to a single aircraft also increased to 72.5 min. The impact of private aircraft departures on the planes awaiting takeoff and on the resulting delay times was also studied. The typical jet with three engines consumes 50 lbs fuel/min. Applying this to the total delay time experienced on Aug. 5, 1971 at LaGuardia, and excess of 140,000 lbs of fuel was consumed by a nonproductive activity. This would cause approximately 3000 lbs of HC and 900 lbs of nitrogen oxides total daily emissions. By modifying the airline departure time to decrease the number of departures on the hour from 115 to 55 and by opening up blocks of time for the uninterrupted departure of private aircraft, unnecessary aircraft engine running and thus air pollution was reduced by 95%. This can also save more than $5 million/yr in operating and maintenance costs at LaGuardia.

38941 **APTIC NO. 62301**

Dworetzky, L. H., W. H. Giles, C. Simon, and R. E. Lee

REPORT ON URBAN EXPRESSWAY AIR POLLUTION AT TEN SITES IN NEW YORK CITY. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 73-104. 2 refs.*

Traffic-generated pollutants were measured in the air at 10 different expressway sites in New York City to gather design data to serve as guidelines fo/ highway designers. Monitoring was performed continuously, 24 hr/day, 7 days/wk, for at least 2 wk at each of the sites, except for one site which was monitored for 1 wk. The sites were three open cuts, two tunnels, two cantilever covered roads, an elevated highway, a grade road, and a covered road. The carbon monoxide data generally behaved as expected. At two sites, CO concentrations exceeded the Environmental Protection Agency standards. At two sites, particulate concentrations exceeded EPA standards. Indoor CO concentrations were measured at five sites and were very close to outdoor levels. Vertical and horizontal distributions of CO concentrations were made for the different types of roads. The diurnal hydrocarbon concentrations increased during the day and generally during rush hour traffic peaks. The HC concentrations at low traffic flow rates were more a function of background concentration than traffic flow at the site.

38942 **APTIC NO. 62677**

Ellsaesser, High W.

THE UPWARD TREND IN AIRBORNE PARTICULATES THAT ISN'T. *Preprint, California Univ., Livermore, Lawrence Livermore Lab., 73p., Sept. 1972. 138 refs.*

NTIS: UCRL-73570, Rev. 1

Diverse data relating to natural and anthropogenic particulate emissions and trends in atmospheric turbidity are reviewed. It is estimated that man contributes 13.6% of the 3.5 times 10 to the 9th power tons of primary and secondary particulates emitted to the atmosphere annually. Values derived for the anthropogenic effect on the trend in total airborne particulates range from 0.06 to 0.4% increase per year. Since such an effect would be only marginally detectable in the available record, the much larger rates of increase which have been published as proof of an upward trend must be due to local or temporary effects and cannot be representative of a global trend. Almost all urban areas plagued by dirty skies prior to 1950 have shown in recent years measurable improvement in terms of visibility, dust fall, suspended particulates or the ratio of sunshine in the central city to that at an outlying station. This lends to the conclusion that while an anthropogenic upward trend in airborne particulates existed in the past, it was halted and may even have been reversed over the past few decades. (Author abstract)

38943 **APTIC NO. 62708**

Fancher, J. R.

TRACE ELEMENT EMISSIONS FROM THE COMBUSTION OF FOSSIL FUELS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 109-113. 8 refs. (Oct. 31-Nov. 2.)*

Trace elements are defined, and their effects and sources are reviewed. Sources of trace elements in combustion systems include utility combustion of oils and coals. Such trace elements include beryllium, boron, scandium, titanium, vanadium, chromium, manganese, cobalt, nickel, copper, zinc, gallium, germanium, arsenic, selenium, strontium, yttrium, molybdenum, cadmium, tin, barium, mercury, and lead. Sinks in combustion systems include collection with the slag or molten fuel impurities, or passage into ducts toward the stacks. Trace elements in the latter can be collected by mechanical collectors such as cyclones, electrostatic precipitators, baghouses, or scrubbers. These are briefly reviewed. A study of mercury input and output at a coal-fired generating station is described. Emissions from combustion generating sources are likely to be strongly bound inorganic compounds, mixtures, and alloys. Trace element emissions from combustion systems cannot yet be readily quantified. More research is needed so that intelligent and objective decisions regarding pollution control can be made.

38944 **APTIC NO. 62700**

Fleischer, M.

NATURAL SOURCES OF SOME TRACE ELEMENTS IN THE ENVIRONMENT. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 3-10. 42 refs. (Oct. 31-Nov. 2.)*

Natural sources of trace elements include rocks which are reacted with by water, plants, animals, and weathering which distribute trace elements to the air, water, and soil. About 90% of the lead, 90% of the cadmium, a small amount of the arsenic, and 30-70% of the mercury in the atmosphere and water come from manmade sources. The rest is due to natural sources such as rocks and volcanoes. The natural and manmade sources are reviewed for these metals.

38945 **APTIC NO. 62274**

Krzyztofik, B., I. Januszewicz, and S. Kaminski

MICROBIOLOGICAL AND DUST CONTAMINATION OF AIR WITHIN THE ENVIRONS OF A CITRIC ACID PLANT. *(Zanieczyszczenia mikrobiologiczne i pylowe powietrza na terenie wytworni kwasu cytrynowego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):54-62, 1972.*

NTIS: TT 72-54023/2

Microorganisms and dusts in the area around a citric acid plant were measured at seven sites. Microorganisms collected by the filtration method numbered 4400 and 18,000 cells/cu m of air at two sites. Values obtained by the collision method were somewhat higher than obtained by the sedimentation method. At the top of the chimney, 0 to 102 cells/cu m were found. The most contaminated sites were on the roof of the New Fermentation building. The sites most contaminated with fingi were in the vicinity of the New Fermentation building. Quantities of dust and microorganisms correlated, but no correlation occurred between temperature and humidity and microorganisms or dusts. A new ventilation system is needed to reduce pollution. The chimney, which had the lowest degree of contamination, should be adapted for use as an air intake for producing citric acid. Electrofilters should be installed to remove dust and microorganisms.

38946 **APTIC NO. 61979**

Ray, G. F.

ENERGY: RESOURCES AND DEMAND IN THIS CENTURY AND BEYOND. *Preprint, British Assoc. for the Advancement of Science, 24p., July 1972. 27 refs. (Presented at the British Association for the Advancement of Science, Annual Meeting, Leicester, England, Sept. 6, 1972.)*

Historical trends in energy demand, present world energy requirements, and future energy demand are reviewed. In the 1960s, energy requirements grew at a rate of 5%/yr. The recent growth rate of the demand for crude oil has been around 7%. It is possible that the demand may have outstripped the rate of addition to known reserves of petroleum. Although the elimination of pollution is to be considered in energy planning, it is impossible to remove all pollution, and costs must be considered in deciding how much to control pollution. Rising standards of living, pollution control, increased population, improved industrial production, and other factors affect the demand for energy, but these factors are flexible. The supply of energy reserves of fossil fuels is limited, but a crisis is not imminent. The rising cost of fossil fuels will cause attempts to economize the use of energy, to improve the economic viability of other sources and forms of energy, and to find more sources. Nuclear energy and other sources will be increasingly used to provide energy. Nuclear technology will ease the pressure on fossil fuels in 20-30 years time.

38947 **APTIC NO. 62204**

Siekierzynska, H. and J. Paluch

EMISSION OF AIR POLLUTANTS OF PLASMA CUTTING OF METALS. *(Emisja zanieczyszczen powietraz przy plazmowym cieciu metali). Air Conserv. (English translation form Polish of: Ochrona Powietrza), 6(3):24-41, 1972. 26 refs.*

NTIS: TT 72-54023/3

The mechanisms which cause the generation of air pollution during the plasma cutting of metals, the display of thermochemical and photochemical reactions, methods of investigations, and values of dust and gaseous emissions are reviewed. The high temperature of the plasma caused by the endothermic reactions among the air, plasma, and metal causes the emission of metal oxide dusts, nitrogen oxides, and carbon monoxide. Intensive radiation of plasma, resulting from photochemical reactions among the air and products of endothermic reactions, causes ozone to form. Near the jet flame, within the range of action of the high temperature of the plasma, dusts, nitrogen oxides, and CO form; beyond this zone of high temperatures, yet still within the reach of plasma radiation, ozone is formed. Experiments on the plasma cutting of alloy steel, carbon construction steel, pure copper, brass, and aluminum showed that the emission of dusts depends on the kind of metal and its thickness; the emission of dusts ranges from 100 to 1500 mg/sec or from 60 to 400 mg/cu cm; emission of gases depends to some degree on the kind of metal cut but not its thickness; and emission of gases fluctuates as nitrogen dioxide from 50 to 150 mg/sec, nitric oxide from 15 to 50 mg/sec, and CO from 0.1 to 0.9 mg/sec. When argon hydrogen and nitrogen hydrogen gas mixtures were used, no correlation was found between the emission of dusts and gases and the kinds of gas used. Because 10 times more dust is emitted than gas and because dusts are at least 10 times more toxic than gas, dusts are significantly important to the noxiousness of the air surrounding the plasma cutting process. Ventilation of the dusts should also remove NO2, NO, and CO.

38948 **APTIC NO. 62293**

Squires, Robert

EXHAUST EMISSIONS FROM MILITARY ENGINE GENERATOR SETS (FINAL TECHNICAL REPORT). *Scott Research Labs., Inc., Plumsteadville, Pa., Army Mobility Equipment Research and Development Center Contract DAAK-02-71-C-0522, SRL 1248 02 0172, 148p., Jan. 1972.*

NTIS, DDC: AD-765 508

The emissions of four gasoline, seven diesel, two turbine, one stratified charge combustion, and one Rankine cycle powered engine generator sets were measured. Comparative emissions were also measured and documented for specified engines equipped with variable jet carburetors, catalytic reactors, ozonators, or air injection systems. All engine generator sets were provided by and tested at USAMERDC, Fort Belvoir, Va. Each set was prepared, set up, and operated by USAMERDC personnel. Exhaust component concentrations and fuel consumption rates were measured at specified engine operating conditions (governing RPM and variable loads). The exhaust analyzer readings were converted to pollutant concentrations and are presented. (Author abstract modified)

38949 **APTIC NO. 62060**

Stanilewicz, W. and P. Dawidczynski

INVESTIGATIONS ON THE EMISSION OF NOXIOUS SUBSTANCES FROM A FACTORY OF OIL PAINTS. *(Badania emisji substancji uciazliwycz z wytworni farb olejnych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(3):48-56, 1972. 5 refs.*

NTIS: TT 72-54023/3

Emissions of pollutants in the area of an oil paint factory were studied. Readily-volatile and slow-volatile substances arising from the polymerization of oil were sampled at the exit of the ventilation system (the discharger), within the ventilation compartment, and in the room for oil polymerization. The average values of slow-volatile compounds, readily-volatile compounds, organic substances (total), and water vapor were 3.9, 1.45, 5.35, and 7.73 g/cu m near the polymerizer, respectively. These values were 1.04, 3.1, 4.14, and 11.5 g/cu m, respectively, in the ventilating compartment. They were 1.53, 0.46, 1.99, and 9.3 g/cu m, respectively, in the discharger.

38950 **APTIC NO. 61978**

Williams, K. R.

ENERGY CONVERSION. *Preprint, British Assoc. for the Advancement of Science, 9p., 1972. (Presented at the British Association for the Advancement of Science, Annual Meeting, Leicester, England, Sept. 6, 1972.)*

Ways in which energy conversion is likely to change in the future are described. The increased need for energy and the limited energy resources require that efficiency of energy conversion be improved. Heat engines have low efficiency, however the efficiency of the boiler/steam turbine unit can be increased by increasing the maximum operating temperature through magnetohydrodynamics (MHD) or by combining a gas turbine with a steam turbine. Fuel cells are being developed for stationary uses and use in vehicles. Some can run on hydrogen, some natural gas, and some on methanol or other fuels. Fuel cells give good efficiency and low pollution. Battery systems are also being developed, but these are probably less efficient than petroleum engines now being used.

38951 **APTIC NO. 62701**

Wixson, B. G., E. Bolter, N. L. Gale, J. C. Jennett, and K. Purushothaman

THE LEAD INDUSTRY AS A SOURCE OF TRACE METALS IN THE ENVIRONMENT. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 11-19. 16 refs. (Oct. 31-Nov. 2.)*

Sources of trace metals in the environment were studied including lead mining and milling operations with the problems of grinding, concentrating, and transporting ores, and disposal of tails along with mine and mill waste water; and the lead smelter-refinery process with problems of concentrate haulage, storage, sintering, refining, atmospheric discharges, and blowing dust. Specific sources in the environment of the New Lead Belt of Southeastern Missouri are reviewed, and the exchange and transport from these operations are illustrated. Water and air pollution caused by the lead industry is reviewed. Air pollutants include sulfur dioxide and particulate lead and other metals.

38952 **APTIC NO. 61669**

Minister fuer Arbeiten Gesundheit und Soziales des Landes Nordhein-Westfalen

EMISSION SURVEY. *(Emissionskataster). Text in German. In: Emissionskataster Koeln. Berichte ueber den Stand der Modelluntersuchung im Grossraum Koeln zur Aufstellung eines Emissionskatasters fuer Luftverumreinigende Stoffe. p. 22-70, 1972.*

An interim report on the results of an emission survey being conducted in the Koeln residential and industiral are regarding emissions from industries, household, trade, and traffic is presented. The principal pollutants emitted by industrial plants are sulfur dioxide, organic gases, nitrogen oxides, and carbon monoxide. Traffic is responsible for the bulk of the CO emissions, followed by domestic heating and trade which also emit SO2, organic gases, dust, and nitrogen oxides. Detailed classification is given of the source-specific and plant-spedific industiral emissions, and the emissions are also classified according to the altitude of the emission sources. The bulk of all emissions in domestic heating and trade are discharged at altitudes between 11 and 20 m. The bulk of such emissions are generated during the heating season, and between 6 am and 10 pm. The traffic density was highest between 7 am and 8 pm, with a maximum between 7 and 8 am and an even higher maximum between 4 and 6 pm. The traffic-generated SO2, nitrogen oxide, CO, hydrocarbon, lead, and soot emissions were also highest between 7 am and 7 pm with a maximum between 7 and 8 am and an even higher peak between 4 and 6 pm.

38953 **APTIC NO. 61690**

Organisation for Economic Co-operation and Development, Air Management Research Group

AIR POLLUTION FROM FUEL COMBUSTION: TERMS OF REFERENCE. *In: Air Management Problems and Related Technical Studies. p. 35-36, 89-93, 1972. 60 refs.*

Specific issues relating to air pollution from fuel combustion that are being evaluated are outlined. The issues are: a quantitative estimation of the probable total atmospheric pollution resulting from the predicted increase in energy requirements during the next 20-30 yr including sulfur oxides, nitrogen oxides, and fine particulates; an examination of the alternatives open to governments in relation to abatement of pollution from combustion of fuels taking into account the variables in fuel characteristics and abatement technology; and an assessment of the extent to which energy policy measures could be framed to maintain emissions within certain limits of air pollution and of the economic implications of imposition of such limits.

38954 **APTIC NO. 61701**

Organisation for Economic Co-operation and Development, Air Management Research Group

INDUSTRIAL PROCESSES. *In: Air Management Problems and Related Technical Studies. p. 133-135, 1972.*

Industrial processes which give rise to the emission of sulfur compounds are named. They include: metal refining; petroleum refining; manufacture of sulfuric acid; paper and pulp manufacture; coke manufacture and steel making; sintering; incineration; cement industries; brick works; and chemical industries. Desulfurization processes which are applicable to industrial sources are the Bahco scrubber, the Topsoe-SNPA process, the French process for Claus Kiln tail gases, and catalytic reduction.

38955 **APTIC NO. 61702**

Organisation for Economic Co-operation and Development, Air Management Research Group

STUDIES IN SWEDEN ON NON FUEL COMBUSTION SOURCES OF SULPHUR COMPOUNDS. *In: Air Management Problems and Related Technical Studies. p. 137-138, 1972.*

Studies being conducted in Sweden on non-fuel combustion sources of sulfur compounds are named. The studies include: Air Pollution Control Problems in the Pulp Industry; Air Pollution Control Problems in the Iron and Steel Industry; Air Pollution Control Problems in the Cement and Limestone Industry; and Air Pollution Control Problems in the Production of Inorganic Chemicals. The reports describe the present emissions from different processes and individual sources. Technical methods and costs of different degrees of control are given. National emission standards were published in Dec. 1969 based on the studies.

38956 **APTIC NO. 62071**

American Paper Inst., New York

A YEAR OF ENVIRONMENTAL AND ECONOMIC PROGRESS IN THE PAPER INDUSTRY. *1972. 18 p., 1972.*

Highlights of 1972 activities of the pulp and paper industry are presented as evidence of continued commitment to economic and environmental progress. Paper and paperboard consumption and production surpassed the unusually rapid expansion of the total economy was measured by the Gross National Product. Vigorous growth in demand and highly favorable operating rates brought the industry considerable increases in after-tax profits. New cash flow will be needed because of increased capital expenditures. The major problems of fuel and energy supplies are reviewed. The export of paper and allied products is increasing because of new demand. The pulp, paper, and paperboard industry has made progress in abating air and water pollution. The paper industry spent roughly $1.1 billion on air and water pollution abatement facilities up to and including 1971, and an additional $414 million in 1972. Sources of fiber consumed by paper and paperboard mills include wood residues, recycled paper, and roundwood. The increased economic utilization of paper waste is being promoted in an effort to aid the environment.

38957 **APTIC NO. 62830**

Royal Commission on Environmental Pollution (England)

SECOND REPORT: THREE ISSUES IN INDUSTRIAL POLLUTION. *Rept. Cmnd. 4894, 12p., March, 1972. 3 refs.*

A report by the Royal Commission on Environmental Pollution is presented on the following issues relating to industrial pollution: confidentiality of information about industrial wastes, the impact of new products on the environment, and the disposal of toxic wastes on land. An early warning system for the impact on the environment of new substances intended for commercial production is suggested along with an international data bank on known correlations between chemical structure and environmental effects. Particular stress is directed toward non-biodegradable substances such as the insecticide DDT and polychlorinated biphenyls. Considerations outlined for assessing the environmental impact of a new product are: the products s toxicity, the scale of production envisaged, and the use to which the product is likely to be put.

1971

38958 **APTIC NO. 61007**

Brocke, W.

AIR POLLUTION BY EMISSIONS FROM CONVENTIONAL POWER PLANTS. *(Die Luftbelastung durch Emissionen konventionneler Kraftwerke). Preprint, Society of German Radiation Protection Physicists and Society for Radiation and Environmental Research, 1971. 9 refs. (Presented at the Society of German Radiation Protection Physicians/Society for Radiation and Environmental Research Joint Meeting, 12th, Environmental Protection in Nuclear and Conventional Power Production, Oct. 8-9, 1971.) Translated from German, 13p.*

Conventional power plants produce dusts, sulfur oxides, fluorine compounds, nitrogen oxides, carbon monoxide, and gaseous hydrocarbons. These emissions in the Federal Republic of Germany are estimated for 1970, 1975, and 1980 for bituminous coal, lignite, heating oil, and gas. From 1970 to 1980, particles are expected to increase by 13%, SOx by 22%, F compounds by 18%, NOx by 34%, CO by 35%, and HC by 13%. Emissions of sulfur dioxide from stationary sources in power plants, industrial plants, and home heating make up 88% of the total emission of SO2 in the German Federal Republic. Power plants will produce 41%, 40%, and 36% of the total SO2 emissions in 1970, 1975, and 1980, respectively.

Power plants will produce 70% and 83% of the F emissions in 1970 and 1980, respectively. Power plants in Germany produce 18 to 23% of the NOx emissions. Half of all particle emissions come from stationary emissions, and 18% came from power plants in 1970. This will rise to 26% by 1980. Different fuels and operating conditions can cause different amounts of emissions. Operating and emission data are given for a 600 MW power plant run on bituminous coal, lignite, heating oil, and gas.

38959 **APTIC NO. 62213**

Busso, Raoul-Henri

IDENTIFICATION AND DETERMINATION OF POLLUTANTS EMITTED BY THE PRINCIPAL TYPES OF URBAN WASTE INCINERATOR PLANTS. (FINAL REPORT). *(Identification et dosage des polluants emis par les principaux types d incinerateurs de residus urbains en service). Text in French. Centre d Etudes Et Recherches des Charbonnages de France, Creil (France), Laboratoire du CERCHAR, Delegation General a la recherche scientifique et technique Contract 69-01-758, A.R. 1414, 68p., Dec. 1971.*

Results of the identification and determination of pollutants emitted by 9 different municipal waste incinerator plants in France are analyzed, and possible ways of abating emissions in such incinerators are proposed. Accidental and unavoidable pollutant emissions are distinguished. The pollutants, caused by the specific operating conditions of the furnace and by the nature of the wastes, include such substances as unburned residues (palmitic and stearic acids, dibutylphthalate, trophenyl phosphate, anthraquinone, acenaphthylene, chrysene, methylfluorene, fluorenone, pyrene, phenanthrene, tetra-, penta- and hexachlorodiphenyls, benzopyrene, benzofluoranthrene, formic, acetic, benzoic, salicylic, phthalic acids, formol, benzaldehyde, methanol, ethanol, carbinol, acetone, cyclohexadiene, coumarine, methylcoumarine, dihydroxycoumarine, phenol, diphenols, triphenols, acetylene, ethene, propene, methyl salcycilate, dimethylhexene, benzene, naphthalene, phenanthrene, naphthonitrile, hydrocyanic acid, phenylquinoleine, acridine, methylacridine, furfurylmethyl ether, dichlorobenzoic acid, monochloroethane, methyl chloride, carbon tetrachloride, trichloromethane, dichloroethylene, propyl chloride, carbon disulfide, and carbonyl sulfide), carbon monoxide, hydrochloric acid, sulfur dioxide, nitrogen oxides, and particulate matter. The rate of emission of accidental pollutants is negligible under the conditions of complete combustion, but it may reach up to 50 kg/ton/hr for CO, and 1.5 kg/ton/hr for organic matter. The specific particulate matter, HCl, SO2, and nitrogen oxides emissions are in the respective ranges of 0.25-5 kg/ton; 0.5-3 kg/ton, 0.02-1.5 kg/ton, and 0.03-0.8 kg/ton. The dust fraction passing the dust separators is in the respirable size range and is the most toxic of all fractions. The emission of accidental pollutants can be abated by optimizing the incineration conditions, and maintaining a temperature range of 750-900 C, and air excess coefficients of 7-9%. The emission of most of the unavoidable pollutants can be abated by the use of high-efficiency flue gas cleaning apparatuses, while the nitrogen oxides emissions can also be reduced by reducing the combustion temperature.

38960 **APTIC NO. 62193**

Cadle, Richard D.

PARTICULATE MATTER IN THE LOWER ATMOSPHERE. *In: Chemistry of the Lower Atmosphere. S. I. Rasool (ed.), New York, Plenum, 1971 (?), Chapt. 2, p. 69-120. 97 refs.*

The nature, concentration, and sources of fine particles in the atmosphere as determined by theoretical and experimental physics, meteorology, astronomy, and chemistry are discussed. Natural sources of particles include oceans, volcanoes, soil, rocks, grass, brush, and forest fires. Air pollution by man can either be widespread as in urban areas or concentrated around an industrial site. There are two types of smog: photochemical smog in which the unpleasant constituents are to a very large extent produced by photochemical reactions involving sunlight acting on air contaminated with organic vapors (especially unburned gasoline and oxides of nitrogen), and coal-burning smog which consists largely of a combination of coal smoke and fog, or just coal smoke. In the composition of the particles in photochemical smog, minerals and other inorganic substances may constitute as much as 50% of the particulate matter. Smog of the coal burning types tends to contain larger particles and a particularly large concentration of carcinogenous compounds as well as flakes of soot. Chemical reactions that produce and alter airborne particles may occur in the open, ambient atmosphere as well as in smog.

38961 **APTIC NO. 62661**

Edwards, H. W., M. L. Corrin, L. O. Grant, L. M. Hartman, E. R. Reiter, R. K. Skogerboe, C. G. Wilber, and R. L. Zimdahl

IMPACT ON MAN OF ENVIRONMENTAL CONTAMINATION CAUSED BY LEAD (PROGRESS REPORT). *Colorado State Univ., Fort Collins, National Science Foundation Grant GI-4, Rept. NSF/RA/E-72-003, 180p., July 1971. 90 refs.*

NTIS: PB 223622

A report is presented on the impact of environmental contamination caused by lead, with particular emphasis on evaluating consequences of lead pollution from traffic exhaust. The focal point for experiments described is measurement of lead transport from Interstate 25 at selected sampling sites in Colorado. Other topics covered include: atmospheric chemistry, inadvertent weather modification, bioaccumulation of lead, lead in soil and plants, analytical formulation of a transport model, and economic aspects of lead contamination. Emphasis is upon pilot experiments to determine where, in what forms, and at what rate lead from traffic exhaust is accumulating in the environment.

38962 **APTIC NO. 61620**

Lemoine, Jacques, Jean Parisot, and Jean Vidal

COMBINED GAS/STEAM POWER PLANT COMPRISING A STEAM GENERATOR, A STEAM CIRCUIT, FLUE GAS-HEATED FEEDWATER PREHEATER, AND DEGASER. *(Kombinierte Gas-Dampf-Kraftanlage mit einem Kampfkreislauf sowie rauchgasbeheizten Speisewasservorwaermer und einem Entgaser). Text in German. (Stein Industrie, Paris (France)) W. Ger. Pat. Appl. 2,023,745. 3p., Feb. 18, 1971. 2 refs. (2 claims).*

A combined gas/steam power plant comprising a steam generator receiving the exhaust gas from a gas turbine and provided with an additional firing system, a steam circuit composed of a condensing turbine with a recuperative feedwater preheater, and feedwater heaters heated by flue gas is described. The degaser is connected with the turbine condenser via a feedwater recirculation line containing a control valve which is actuated as a function of the feedwater temperature at the entry into the degaser. The inlet temperature to the degaser is stabilized regardless of the specific operating conditions. The recirculation line with the control valve can be bypassed.

38963 **APTIC NO. 62690**

Roberts, Fred S.

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY. *Rand Corp., Santa Monica, Calif., National Science Foundation Grant GI-44, Rept. R-756-NSF, 51p., May 1971. 25 refs.*

A methodology is outlined which exploits the signed digraph for handling problems of forecasting energy demand and the effect of new technologies and institutions on that demand, and for generating and analyzing policy alternatives for meeting environmental constraints on energy use. Many problems of society, including those relating to energy use, air pollution, and solid waste disposal seem amenable to formulation using the signed digraph. The forecasting and policy problems are translated into signed digraph problems and in particular to problems of so-called pulse processes on signed digraphs. Research problems related to the development of the methodology are described. (Author abstract modified)

38964 **APTIC NO. 61668**

Smith, Michael R. and Richard E. Forbes

MASS-ENERGY BALANCE FOR AN S-IC ROCKET EXHAUST CLOUD DURING STATIC FIRING. *Mississippi State Univ., State College, Inst. of Environmental Sciences, National Aeronautics and Space Agency Contract NGL 25-001-32, Rept. NASA CR-61357, IES-70-10-1, 28p., Aug. 4, 1971. 3 refs.*

Many factors affect the rise rate, growth and ultimate geometry of exhaust clouds produced by the static firing of space boosters. The mass, heat, and momentum imputs into the cloud along with the prevailing meteorological conditions significantly affect the cloud formation and dissipation process. Mass inputs to the exhaust cloud are the combustion products and water vapor originating from the evaporation of cooling water in the exhaust deflector. An analytical approach to the cloud growth phenomenon must consider the coupled effects of conservation of mass, momentum, and energy, in addition to the equation of state and appropriate initial and boundary conditions. A mass-energy balance has been determined for the exhaust cloud generated during the static firing of the S-IC rocket engine (first stage of the Apollo V flight system) at the National Aeronautics and Space Agency Mississippi Test Facility. Measurements show that approximately 40,300 lb/sec of cooling water are evaporated and entrained into the exhaust jet, which possesses a mass flux of 28,680 lb/sec. The total energy of the exhaust products was 1.321 times 10 to the 10th cal/sec/ however, after evaporating the cooling water only 0.5293 times 10 to the 10th cal/sec was available as sensible heat and kinetic energy. The total energy flux of the mixture as it was ejected into the atmosphere was about 40% of the total energy flux of the exhaust products and about 30% of the total energy flux of the mixture of the cooling water and the exhaust products. (Author absract)

38965 **APTIC NO. 62212**

Edison Electric Inst., New York, Electric Power Survey Committee

FIFTIETH SEMI-ANNUAL ELECTRIC POWER SURVEY. (FINAL REPORT). *EEI Rept. 71-53, 52p., Oct. 1971.*

Results of the Fiftieth Semi-Annual Electric Power Survey by the Edison Electric Institute are reported. The survey covers practically the entire electric utility industry of the United States, including investor-owned systems, those of governmental agencies, and rural electric cooperatives. Survey results pertaining to power system capabilities, loads, gross margins, and energy outputs are presented for each of the eight power supply regions of the country as defined by the Federal Power Commission. Summations of these regional data are presented and referred to as Survey Totals for the Eight Regions. Also presented are figures which represent the Total Electric Utility Industry of the contiguous United States plus Hawaii. Appendices covering scheduled additions to electric generating capacity and definitions and methods of summarizing data are also included.

1970

38966 **APTIC NO. 62284**

Dikun, P. P., N. D. Krasnitskaya, E. G. Levitina, L. S. Sarochinskaya, G. N. Severinets, and N. L. Staskevich

CONTENT OF 3,4-BENZPYRENE, SOLID PARTICLES, CARBON MONOXIDE AND NITROGEN OXIDES IN COMBUSTION PRODUCTS OF GASES IN KITCHEN GAS RANGES. *Hyg. Sanit. (English translation from Russian of: Gigiena i Sanit.), 35(9):361-366, 1970.*

The combustion products liberated by the experimental burning of liquefied gas in a four-ring and a two-ring range were studied. Less pollution was detected in the combustion products of two- unit stoves, since they are equipped with both central and peripheral air supply. The amount of pollution depended on the composition of the fuel used. When liquefied gas was burned, the combustion products contained more 3,4-benzopyrene and carbon monoxide than at the burning of natural gas. The effect of primary air ensuring steady burning without flame separation and flashback and the effect of primary air excess factor on CO, 3-4 benzopyrene, nitrogen dioxide, and solid particles are described. Incomplete combustion, determined from the presence of CO in the combustion products, was not always accompanied by the liberation of 3,4-benzopyrene.

38967 **APTIC NO. 61685**

Milford, Nevil, Gerard C. McCoyd, Leonard Aronowitz, and Joseph H. Scanlon

AIR POLLUTION BY AIRPORTS. *Preprint, Grumman Aerospace Corp., Bethpage, N. Y., Geo-Astrophysics Section, 14p., July 1970. 17 refs. (Presented at the Institute of Environmental Sciences, Technical Meeting, Boston, Mass., April 12-16, 1970, Paper RE-383J.)*

Problems associated with understanding and solving air pollution by airports are discussed. There is no information available on the actual concentrations of pollutants in the surrounding communities produced by the airport emissions. A dispersion model for airports was subsequently developed which employs data on the airport pollutant sources to calculate the concentration of pollutants as a function of position relative to the airport for various meteorological conditions. The outlook for reduction of airport pollution is hopeful for carbon monoxide, organics, and particulates. While nitrogen oxides reduction appears impractical at present, it is not yet clear whether its level in neighboring communities will be large enough to degrade the ambient air quality appreciably. Less is known about other constituents, such as aldehydes and trace metals, pointing to the need for additional investigations.

1966

38968 **APTIC NO. 57975**

Rees, O. W., N. F. Shimp, C. W. Beeler, J. K. Kuhn, and R. J. Helfinstine

SULFUR RETENTION IN BITUMINOUS COAL ASH. *Illinois State Geological Survey, Urbana, Circ. 396, 10p., 1966. 6 refs.*

Retention of sulfur in bituminous coal ashes prepared in a laboratory was related to ashing temperature and to amounts of sulfur and calcium present in the coal. Evidence was also obtained in support of the theory that catalytic oxidation of sulfur dioxode to sulfur trioxide influences retention of sulfur as calcium sulfate in coal ash. Iron oxide produced during coal combustion acts as a catalyst for this reaction. Factors affecting sulfur retention in coal ash prepared in the laboratory at 800 C were not applicable to most industrial combustions because of the relatively higher temperatures (usually greater than 1000 C) involved in commercial applications. Since these temperatures are above ther thermal decomposition temperature of calcium sulfate, it does not form and hence cannot serve as a sulfur retaining agent. The small amount of sulfur found in power plant coal ashes was related to carbon remaining in the ash after combustion and was of no practical significance in reducing sulfur emission to the atmosphere.

1962

38969 **APTIC NO. 61012**

Smokotnina, T. N.

HYGIENIC EVALUATION OF AIR POLLUTION WITH WASTES FROM A LEAD PLANT. *(Gigiyenicheskaya otsenka zagryasneniya atmosfernogo vozdukha vybrosami svintsovogo zavoda). Gigiena i Sanit., 27(6):87-90, June 1962. 10 refs. Translated from Russian, 7p.*

The atmospheric wastes from a lead plant were studied in 1959-1960. Smoke and gases from the sintering mill are cleaned in electrostatic precipitators and discharged into the atmosphere through a stack 75 m high, with a dust content up to 0.3-0.4 g/cu m and lead up to 0.15-0.2 g/cu m. As a consequence of inadequate filter capacity, about 20-30% of the gases are discharged into the atmosphere without cleaning, through a stack 22 m high, with a dust content of 0.45 g/cu m. Sulfur dioxide is not cleaned from the sintering waste gas. The smelter flue gas is cleaned in bag filters and discharged into the atmosphere through 23-40 m stacks, with a dust content of 0.0149 g/cu m and 0.75 g/cu m lead. The bag filters are overloaded, and gases are discharged from the reverberatory furnace without cleaning. Ventilation gases are also discharged without cleaning. Contamination of the environment was studied by seasons of the year by periodic samples of atmospheric air, soil, washes from plants and wind glass for lead, arsenic, and SO2. The average Pb and SO2 concentrations exceeded the permissible maximums at all observation points. The average arsenic trioxide concentration only exceeded the maximum permissible concentration at 2.5 km from the plant. At the control point, Pb, SO2, and arsenic trioxide were not found in the air. Soil near the plant contained considerable amounts of lead and arsenic. Washes of dusts from windows had six to eight times more lead and seven to 8.3 times more arsenic at 0.5 km from the plant than at 5 km. Washes of tree leaves had 15.2 times more Pb and eight times more arsenic at 0.5 km than at 5 km from the plant. At 0.5-1 km from the plant, 0.038-0.043 mg Pb/l cow s milk was found in the summer and 0.06-0.09 mg/l in the fall. Persons living in the area complained of odors, dust, and disease. Rabbits kept in wire cages 0.5, 1, 1.5, 5, and 40 km from the plant were studied. Lead content in the rabbits increased with decreasing distance to the plant.

1954

38970 **APTIC NO. 61013**

Tafel, V. (ed.)

PROCESSING OF OXIDIC ORES AND SECONDARIES. *In: Lehrbuch Metall-Heuttenkunde. Part 1, 2nd ed., Leipzig, Germany, 1954. p. 410-463. 18 refs. Translated from German, 97p.*

The reduction of rich oxidic ores in the production of copper is described, including the apparatuses and furnaces used in the early 1950 s. The use of waste products in the refining of pure copper and in the production of its alloys are discussed, as are the theoretical principles governing the production of such alloys. All types of copper refineries are described, and the relative merits of each type of installation and process are discussed. Waste products including air pollutants such as dust and ashes are mentioned, and various control methods and equipment are described.

CONTROL METHODS

1974

38971 **APTIC NO. 62086**

Armento, W. Joseph

EFFECTS OF DESIGN AND OPERATING VARIABLES ON NOX FROM COAL-FIRED FURNACES--PHASE I (FINAL REPORT). *Babcock and Wilcox Co., Alliance, Ohio, Research and Development Div., Environmental Protection Agency Contract 68-02-0634, ROAP 21ADG-41, Program Element 1AB014, EPA-650/2-74-002a, 150p., Jan. 1974.*

NTIS: PB 229 986/AS

Combustion modification techniques which might be applicable to control nitrogen oxides from pulverized coal-fired utility boilers were investigated and the relative effectiveness of these methods for gas and oil combustion were compared. The techniques studied were excess air, air preheat, rating, flue gas recirculation, staged combustion, quench, and swirl. There is a distinct difference in nitric oxide emissions from coal and gas attributable to fuel-bound nitrogen. The conversion of fuel-bound nitrogen is directly proportional to the level of excess air and inversely proportional to the level of air preheat. Reductions of up to 50% in NO emission levels are possible using staged combustion. Reduction of excess air levels from 30 to 0% can yield similar results. Flue gas recirculation shows only moderate reduction. Fuel-bound nitrogen conversion increases with increasing excess air level and decreasing temperature. At substoichiometric conditions, the final precursors of NO formation from either fuel-bound N2 conversion or thermal atmospheric fixation are identical. For existing units, control of excess air promises to be the best method for NOx reduction. For new units, staging is the most promising with a physical separation of the two stages. (Author abstract modified)

38972 **APTIC NO. 61774**

Arnold, Eckhard and Wolfgang Kern

THE TRASH DISPOSAL PLANT PINNEBERG. *(Die Muellverwertungsanlage Pinneberg). Text in German. Energie Tech., 26(2):36-39, 1974.*

In May 1974 the largest known trash disposal plant will start operation. It is a combined composting and incineration plant. Two hundred and forty tons/day are composted in four bioreactors by the DANO biochemical composting method. For incineration of the composting remains, as well as bulky, industrial, and commercial refuse two incineration units, each with a throughput oof five tons/hr, are available. More than 50 municipalities are connected to the plant. The storage bunkers have a capacity for 575 tons of trash and for 330 tons of bulky refuse, sifting remains, and industrial refuse. There are 11 discharge points. The composting drums are 28 m long and 3.5 m in diameter. They rotate with a speed of about 1.2 rpm during the day and 0.6 rpm at night. For optimum composting conditions oxygen is injected into the various decomposing zones. The vapors developing from aerobic decomposition are drawn off and passed to an earth filter, which consists of six 2.5 m long perforated pipes with a diameter of 400 mm. They are covered with a 40 cm thick gravel layer upon which 1.5 m of fresh compost is heaped. The gases are entirely deodorized through this filter. The hot gases from the incinerator are cooled by water injection from 1050 to 300 C and cleaned in electrostatic precipitators to the required dust concentration of 150 mg/cu m. The cleaned gases are discharged via a 50 m stack. The total costs for the plant were 8 million dollars. Two classes of compost are produced; one with a grain size of less than 20 mm and another with a grain size of less than 10 mm. The operating costs for composting amount to $14/ton.

38973 **APTIC NO. 62477**

Asano, Hiroshi

ELECTROSTATIC PRECIPITATORS. *(Denki shujin shisutemu). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(6):32-36, June 1974. 4 refs.*

The structure of electrostatic precipitators, cost analyses for various parts, and factors affecting the costs of electrostatic precipitators are discussed. The costs are affected by the quantity of treatment gas, the collection efficiency, the pressure and temperature of the gas, the properties and characteristics of dusts, the environment for installation, and other special factors. The performance and cost relationship is theoretically functional. The higher the efficiency, the greater the cost because the system has to be larger. For instance, an equipment with a 90% performance capacity has to be doubled in size in order to increase the performance to 99%, and be tripled in size to attain 99.9% performance. The static pressure of treatment gas is normally about 100 nmA2, but when it is above that, the casing msut be fortified, the insular chamber must be redesigned, and the leaks from the ash bunker be prevented. The normal temperature is about 200 C; when it is higher, a slide mechanism should be adopted, each part should be fortified, and the thickness for heat-retention should be increased. When the gas temperature is very high (300-400 C), the entire structure must be changed. When corrosive gases or explosive gases are to be treated, special safety measures must be included in the system, and the cost will increase considerably.

38974 **APTIC NO. 61824**

Atsukawa, Masumi, Toru Seto, and Kenji Inoue

ELIMINATION DEVICE FOR STACK GAS TOXIC SUBSTANCES. *(Haigasu-chu no yugaibutsu o jokyo suru sochi). Text in Japanese. (Mitsubishi Heavy Industries, Co., Ltd., Tokyo, Japan) Japan. Pat. Sho 49-16187. 5p., April 20, 1974. (Appl. Nov. 5, 1970, 1 claim).*

To eliminate the weaknesses of the pellet type air-gas contact absorption system and of the fluidized adsorption bed, this gas treatment system combines solid-gas contact absorption with bag filters. The gas containing toxic matter is led to the mixing chamber, and is mixed with a powder-form absorbent. The gas rises and goes through a number of bag filters. The absorbent powder collected on the filter bags is shaken off and sent to the collection hopper. Since mixture of powder and gas is quickly achieved, several seconds of contact eliminates gas effectively. The filters also eliminate toxic substances and soot and dusts. The system was utilized for cleaning boiler gas of about 130 C, with 1000 ppm of sulfur dioxide. About 100 g/N cu m of strongly reactive powder absorbent was was added. The concentration of SO2 gas at the entrance was about 620 ppm, and the absorption rate solid-gas mixture was 40%. The SO2 elimination rate by filter bags was 50%, and the SO2 concentration at the exit was 300 ppm. The pressure loss was about 250-270 mm H2O.

38975 **APTIC NO. 61752**

Azuma, Takekuni

ODOR ELIMINATION BY OZONE. *(Ozon-ho ni yoru akushu jokyo). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(2): 79-84, Feb. 1974. 13 refs.*

The ozone deodorization process is achieved by both oxidation (decomposition) and neutralization of bad odor elements. Oxidation is enhanced by coexistence of steam, and ozone reacts to many organic substances quickly. The reactions to inorganic substances are quantitative and instantaneous. The most effectively neutralized or decomposed odors are mercaptans, sulfides, amines such as trimethylamine and dimethylamine, phenol, and low class nonsaturated hydrocarbons. Ozone deodorization is effective in emission sources which emit the above mentioned odor elements, such as sewages, Kraft pulp mills, and fish meal processing plants. The reaction chemical formulas are presented. Odor emission sources in actual environments in all cases produce complex odors, and ozone oxidation seldom ever achieves complete deodorization. The process therefore is often combined with pre- or post-treatment systems. The most common combination is with a scrubber. The basic structure of a deodorization system comprises an aeration tank, an ozone aeration tank, an ozonizer, a neutralization tank with alkaline solution. Various odors were tested by a a special deodorization system comprising a scrubber with ozone and alkaline solution, a demister, and an activated carbon layer. The scrubber absorbed amine and other soluble odors, and the liquid interface achieved oxidation decomposition; activated carbon oxidized and adsorbed sulfides and other nonsolubles and decomposed excess ozone. An appropriate amount of ozone (5 ppm) could deodorize 98.7% of 15 ppm triethylamine, 90-95% of 4.5 ppm hydrogen sulfide, and close to 100% of 3.2 ppm methyl mercaptan. This system was applied to the treatment of exhaust from the trickling filter of a sewage treatment plant. A gas odor concentration of 400-1000 can be reduced by 8-16 by 5 ppm of ozone.

38976 **APTIC NO. 62773**

Beavon, David Kent

IMPROVED PROCESS FOR REDUCING SULFUR CONTENT OF EFFLUENT GAS STREAMS. *(Parsons, (Ralph M.) Co., Los Angeles, Calif.) Brit. Pat. 1,344,471. 7p., Jan. 23, 1974. (Appl. Jan. 12, 1971, 19 claims).*

An improved process for reducing sulfur content of effluent gas streams is described. The sulfur losses from a S forming process employing catalytic S forming stages, such as Claus-type units, can be considerably reduced by continuously hydrogenating the effluent gas stream from one or more catalytic S forming stages with hydrogen in an amount at least equal to the stoichiometric quantity of hydrogen required to convert the contained sulfur dioxide and free S to hydrogen sulfide at a temperature of from 300-1200 F, removing at least part and preferably a substantial amount of the water vapor present in the gas stream, then oxidizing at least a portion of the formed H2S to S in at least one additional S forming step. The tail gas from this step will be relatively free of S compounds.

38977 **APTIC NO. 62552**

Beltran, M.

ENGINEERING/ECONOMIC ASPECTS OF ODOR CONTROL. *Chem. Eng. Progr., 70(5):57-64, May 1974.*

Various odor abatement systems are surveyed along with their application to industrial processes. Odor abatement equipment discussed include: incinerators, condensers, adsorption devices, scrubbers (absorption), odor neutralizers, filters, and electrostatic precipitators. Incinerators combust odorous organic fumes; condensers condense steam and odorous gases; adsorption devices, such as activated carbon, adsorb the odorous gases; scrubbers remove soluble odorous gases or gases which react chemically in solution; odor neutralizers mask and counteract the odor; and filters and electrostatic precipitators collect odorous smokes composed of sub-micron particles. Categories of incineration reviewed include: open flame burning, direct fume incineration at high temperatures, and catalytic oxidation. A cost comparison is given for the various systems; and, with the exception of activated carbon adsorption equipment, most of the odor abatement systems discussed haveve an initial installed cost of several dollars per cu ft/min.

38978 **APTIC NO. 62416**

Benson, H. E. and R. W. Parrish

HIPURE PROCESS REMOVES CO2/H2S. *Hydrocarbon Process., 53(4): 81-82, April 1974. 2 refs.*

The HiPure process is applicable for gas purification where hydrogen sulfide must be removed to 1 ppm or less and carbon dioxide must be removed to only a few ppm. The process ability to reduce these compounds to such a low level makes it an excellent choice for purification of natural gas to pipe line purity, as well as for liquefied natural gas purposes. The process gas is first contacted with normal Benfield hot carbonate solution and is then contacted with a separate solution of somewhat different composition for absorption of the impurities. The HiPure process costs 5-10% more than the Benfield process in a syngas purification, but uses 22% less regeneration heat. The process can be used in purification of synthesis gas where a methanation step is used and where process costs are inflated, in purification of refinery gases, in the treatment of natural gas for pipe line gas, for treatment of natural gas feedstock for liquefied natural gas production, for CO2 and H2S removal from partial oxidation gases, in bulk CO2 removal from gas streams with low CO2 partial pressure, and in production of high-purity hydrogen where molecular sieves are used to remove residual amounts of CO2 after bulk CO2 removal.

38979 **APTIC NO. 62473**

Bergmann, Lutz

HIGH TEMPERATURE FABRIC FILTRATION: AMERICAN EXPERIENCE AND INNOVATIONS. *Filtration Separation (Purley), 11(2):157-168, March/April 1974. 14 refs. (Presented at the Filtration Society s Conference on What s New in Dust Control and Air Cleaning, Dust Control and Air Cleaning Exhibition, London, England, Sept. 25-27, 1973.)*

Air pollution control in the U. S. is being progressively enforced by the Environmental Protection Agency and this is creating a market for fabric filters which is increasing by at least 10% a year. The letest estimate for 1971 showed that American filter cloth sales stood at 12,000,000 lbs a year compared with 10,000,000 lbs in Europe. In the iron, steel, and foundry industry baghouse collectors are used in several areas including furnaces, coal and coke plants, raw material handling, sinter plant, foundry, hammer mills, conveyor transfer points, carpenter shops, and scrap shops. In the cement industry there are today more than 50 baghouses on kilns and more than 30 clinker cooler operations which already have or will shortly employ fabric filter units handling an average of 120,000 cfm. The use of woven glass filter fabrics in the U. S. carbon black industry represents 3 to 4 million dollars of sales annually and is by far the largest market for glass fibers. Fabric filters are not generally used in the power industry. To make their application feasible here a highly efficient filter system would have to be developed. Besides shaker and reverse air baghouses, the so-called Pulse-Jet, high ratio, or cage type filter is the most common filter equipment in use. Filtration theory is briefly reviewed, as are the different types of filter fabrics including glass, Nomex (nylon), Glamex (glass and Nomex), and teflon.

38980 **APTIC NO. 61715**

Boer, P. C. T. de and William McLean

HYDROGEN: FUEL OF THE FUTURE FOR TRANSPORTATION ENGINES. *Eng.: Cornell Q., 8(4):23-30, Winter 1974.*

The inevitable and imminent exhaustion of petroleum supplies gives special importance to the emergence of hydrogen as a potential fuel. Its use in transportation vehicles is discussed. Potential sources of hydrogen are nuclear reactors which could produce enough hydrogen for use as a transportation fuel, to generate other synthetic fuels, or for hydrogen fuel cell electric vehicles. Hydrogen-fueled internal combustion engines would reduce pollution. Hydrogen can be injected to give more energy than gasoline. The improvement in specific power which can be obtained by supercharging hydrogen instead of gasoline as the fuel is about 20%. The engine efficiency and maximum power output increase when the compression ratio increases. Unfortunately, increases in the compression ratio result in higher combustion temperatures and therefore higher nitrogen oxide emissions. Research is being undertaken to determine the degree to which hydrogen-fueled engines can comply with exhaust pollution standards. Hydrogen engines also have problems of safety, cost, and storage. Several hydrogen-fueled cars are in existence, and hydrogen cars are being studied. Hydrogen may be the fuel of cars of the future.

38981 **APTIC NO. 62752**

Braemar, Frank Charles

ANNULAR VENTURI SCRUBBER. *(Chemical Construction Corp., New York) Brit. Pat. 1,342,639. 8p., Jan. 3, 1974. (Appl. May 26, 1971, 9 claims).*

An annular venturi scrubber is described for scrubbing of impurity laden gas streams. The principle advantage of the apparatus and venturi throat openings is that they are adjustable to compensate for variations and changes in gas flow rate. A high scrubbing efficiency and removing of the entrained impurities from the gas stream is attained. The entrained impurities may consist of entrained solid particles such as fly ash, liquid droplets, or a vaporous or gaseous component of the gas stream. This adjustable venturi is advantageous compared to venturi scrubbers in which a central cone is displaced vertically for adjustment, since such displacement results in the introduction of the liquid into the gas stream at different horizontal planes. The greater vertical displacement thus increases possibilities of dirty gas bypass.

38982 **APTIC NO. 62887**

Braun, W. and H. Dau

IMPROVED AIR QUALITY THROUGH TARGET-ORIENTED MANDATORY CONNECTION AND USE OF LINE-BOUND POWER. *Verbesserte Luftqualitaet durch gezielten Anschluss-und Benutzungszwang zugunsten leitungsgebundener Energietraeger). Text in German. Tech. Mitt., 67(5):205-211, May 1974. 24 refs.*

Steps towards mandatory connection and use of line-bound power are particularly important for densely populated and industrialized areas with high atmospheric pollution, since sulfur-free fuel oil and liquid gas are not available in sufficient quantities. For technical and economical reasons and because line-bound power in the form of electricity and remote heat are available to a limited extent only, those areas with the highest emission and immissions must be the target for introduction of such steps. The evaluation of the air quality which leads to a decision of whether or not such steps are initiated must be based on a consideration of the climatic conditions (primarily on the frequency of temperature inversions). The legal basis for a mandatory connection to line-bound power and heat supply is discussed.

38983 **APTIC NO. 61938**

Bruck, Klaus and Lars Douren

THE REMOVAL OF DUST DEPOSITS THROUGH SOUND. *(Entfernung von Staubablagerungen durch Schall). Text in German. Erzmetall, 27(3):152-153, 1974.*

The use of vibrating compressed air was tested for combating dust depositions in the convection section of a waste heat boiler belonging to a Boliden sulfuric acid production plant from pyrite. The process employed for production of sulfuric acid is superior to conventional methods with regard to environmental protection and product quality. Pyrite is roasted in a fluidized bed furnace with underfed air at 900 C. The roasting gases and the forme/ iron oxide are passed to cyclones where about 90 percent of the iron oxide is separated in very pure form. The hot iron oxide is cooled in a fluidized bed cooler. The hot gases return to the roasting furnace. The cooling tubes in the fluidized beds are connected to the waste heat boiler behind the furnace. The roasting gas from the cyclone which still contains fine dust is cooled in the waste heat boiler. Before and after the waste heat boiler an accurately controlled quantity of air is added through which an afterburning of sulfur and other combustible components which remained in the roasting gas is achieved. The method has the advantage that no oxygen is available in the roasting section for the oxidation of SO2 to SO3. Also in the cooling section the oxygen quantity available for this oxidation is low. The SO2 gas from the waste heat boiler is cleaned in an electrostatic precipitator and in further scrubbing stages from where neutralized chloride filtrate is discharged into the receiving stream. The application of compressed vibrating air concentrates on the phases of cleaning and cooling. For optimum heat utilization of the roasting gas short repeated applications were necessary with each sound transmitter switched on twice for periods of 15 sec with a 15 sec interval. This process must be repeated every six minutes.

38984 **APTIC NO. 62401**

Carlqvist, S. G. and L. G. H. Ortegren

THE POTENTIAL IMPACT OF THE STIRLING ENGINE ON ENVIRONMENTAL ISSUES. *Transport Eng. (London), no. 49:7-16, April 1974. 7 refs. (Presented at the Royal Society of Arts, Institute of Road Transport Engineers, Jan. 1974.)*

The development of Stirling engines in Sweden, potential fields of application, exhaust emissions, noise emissions, fuel conservation, and the potential for exhaust-free operation are reviewed. Although some substantial engineering breakthroughs have been made, there is still a lot of work to be done on Stirling engines, especially in the areas of endurance testing and manufacturing cost reduction. Prototype engines have already verified that Stirling engines will comply with the most stringent exhaust emission standards known and that they can reduce vehicle noise. When a Stirling engine was simulated, 0.1 g/mi hydrocarbons, 0.9 g/mi carbon monoxide, 0.6 g/mi nitrogen oxides without exhaust gas recirculation, and less than 0.4 g/mi NOx with EGR were obtained. The Stirling engine can use many types of fuels including nonleaded gasoline, diesel oil, kerosene, fuel oil, and alcohol. The engine s efficiency over the speed and load range used give it good fuel economy.

38985 **APTIC NO. 61754**

Carroll, J. J., J. R. Dunbar, R. L. Givens, and W. B. Goddard

SPRINKLING FOR DUST SUPPRESSION IN A CATTLE FEEDLOT. *Calif. Agr., 28(3):12-14, March 1974.*

The effectiveness of sprinkling open, unpaved, feedlot cattle pens for dust control, and the effect of sprinkling on the temperature and relative humidity were investigated. The air temperature, humidity, and dustiness were measured simultaneously at several locations within two lots, one of which was sprinkled. Data recording was begun on June 25, 1970 and was terminated on Sept. 9, 1970. The data consisted of 15 min samples taken once each hr, 24 hr per day. The results show that sprinkling lots during the first 8 week clearly reduced dustiness by about one-half. During the period following rain, the dustiness of the unsprinkled lot was also reduced by at least half. The maximum temperature reached within the sprinkled lot was reduced by 5-10 F, the relative humidity increased by about 30%. This suggests that sprinkling has no significant effect on the evaporative cooling of the animals.

38986 **APTIC NO. 62837**

Chew, Frank Dubois

SMOKE ABATEMENT APPARATUS. *(Assignee not given.) Brit. Pat. 1,346,121. 5p., Feb. 6, 1974. (Appl. Aug. 22, 1972, 5 claims).*

A smoke abatement apparatus is described for smokes containing corrosive oxides and non-combustible materials. It consists of a venturi which acts to emulsify any non-combustible and corrosive materials in a high velocity jet stream of wetting fluid emitted into the converging inlet of the venturi. The jet stream causes aspiration and scrubbing of smoke or gases so as to emulsify them and to permit the emulsified materials to be collected in the tank and pumped therefrom with fluids to a suitable disposal or settling pond. Non-condensible and nonsolubles can be collected mechanically in the foam within the tank so that the corrosive materials may chemically be treated and subsequently removed from the tank and conducted to a suitable disposal area. The pump is provided to remove emulsified materials and fluids from the pump of the collecting tank so that metal oxides or other materials may be collected in the form of a mud in order that those having substantial value may be readily retrieved.

38987 **APTIC NO. 61887**

Deguchi, Yataka, Toshiro Inukai, Kenhachi Shiraki, Keiichi Tsukui, and Kenzo Adomi

DEVELOPMENT OF NEW ELECTROSTATIC PRECIPITATION. *(Atarashii denki shujin hoshiki no kaihatsu). Text in Japanese. Sanyo Denki Giho (Sanyo Tech. Rev.), 6(1):82-94, 1974. 7 refs.*

Three new methods for electrostatic dust precipitation are described. A liquid membrane dust precipitator is composed of a hollow discharging electrode and a cylindrical dust collecting electrode. High voltage is applied to the discharging electrode to which a liquid is introduced. The liquid rotates and forms a membrane while reaching to the cylindrical electrode. Dusts in air passing through the membrane are forced to adsorb on it while the rotating liquid also serves as a washing agent for the dust collecting electrode. A spiral dust collector is constructed by using thin, spiral metal plates with the same width. A discharge wire is placed in the hollow center which is served as the ionization space for air. A combination of four spiral collectors is most effective at 100 KV when each stage contains 23 to 56 plates. An isolated collector electrode is composed of a set of needle poles, a dust collecting electrode, and a repulsion pole. The dust collecting efficiency of this collector depends on the needle pole distribution and the position of the dust collecting electrode.

38988 **APTIC NO. 61798**

Dettmer, Edwin, Horst-Carsten Groth, and Walther W. Szubinski

CONSTRUCTION AND OPERATION OF A COMBINED HOT BLAST CUPOLA FURNACE WITH INDUCTION FURNACE FOR MELTING IN AN IRON FOUNDRY WITH MIXED PRODUCTION PROGRAM. *(Bau und Betrieb einer kombinierten Heisswind-Kupolofen-/Induktionsofen-Schmelzanlage fuer eine Eisengiesserei mit gemischtem Fertigungsprogramm). Text in German. Giesserei (Duesseldorf), 61(8):181-185, 1974.*

At the construction of a water-cooled hot blast cupola furnace with a nominal melting capacity of 12.5 t/h and of four 12.5-ton crucible furnaces great emphasis was placed on reduction of the dust and sulfur dioxide emissions. All waste gas from the blast furnace is drawn off and passed to the dust collection system over water-cooled pipes. First the coarse dust is separated in a cyclone. The cyclone is followed by a gas cooler and a scrubber, with a subsequent droplet separator. The cleaned, water-saturated gas leaves the 24-meter stack with a temperature between 40 and 50 C. In the scrubber a considerable amount of sulfur compounds are washed out. The hourly water consumption amounts to 55 cu m, 25 cu m for the scrubber, and 30 cu m for the cooler. The evaporation losses of the droplet separator with off-gas stack and of the sludge settling basin amount to 10% of the hourly water consumption. The circulating water has a constant pH of 8.0 through addition of caustic soda. The acceptance tests yielded an average dust concentration in the cleaned gas of 92 mg/cu m. A specific dust emission of only 0.08 kg/t iron was obtained which is far lower than the maximum allowable one of 0.4 kg/t. The hourly SO2 emission of 3.7 kg is also below the maximum allowable one of 5.1 kg/hr at maximum melting capacity.

38989 **APTIC NO. 62657**

Deurbrouck, Albert W.

PERFORMANCE CHARACTERISTICS OF COAL-WASHING EQUIPMENT: HYDROCARBONS. *Bureau of Mines, Washington, D. C., Rept. RI 7891, 26p., 1974. 14 refs.*

The performance characteristics of five hydrocyclone coal washers were evaluated to determine the sharpness and efficiency of separation that might be anticipated in commercial operation. The hydrocyclone overflows contained generally good clean coal products that would require little retreating to remove misplaced high-gravity material. The underflows, however, contained from 63.6 to 36.7% of misplaced low-gravity material, which would require secondary cleaning to provide acceptable clean coal yields. The sharpness criteria values for error area and probable error were quite poor. The error values ranged from 127 to 152, and the probable error values ranged from 0.246 to 0.297. The range of imperfection values was scattered so widely that the use of this criteria of washing performance was rendered invalid. The size classification effect in hydrocyclones is quite pronounced, the specific gravity of separation increases very rapidly as the particle size of the feed becomes finer. (Author abstract modified)

38990 **APTIC NO. 62149**

Dietrich, Hans

NEWER FINDINGS CONCERNING COLLECTION AND RECOVERY OF POWDERS AND FINE DUSTS WITH THREE DIMENSIONAL FILTER MEDIA, PARTICULARLY NEEDLE FELTS. *(Neuere Erkenntnisse bei der Abscheidung und Rueckgewinnung von Pulvern und Feinststaeuben mit dreidimensionalen Filtermedien, insbesondere Nadelfilzen). Text in German. Staub, Reinhaltung Luft, 34(5):176-180, May 1974. 3 refs.*

Needle felts made from all known synthetic fibers are three dimensional filter media. Their elements are single fibers. The advantages of needle felts are based on the fact that they allow high air-to-cloth ratios as a result of their large filtering surface. There exists a clear correlation between the air permeability and the separation rates achieved. An important role is also played by the high pore volume, the adjustable pore diameter, and the pore opening pressure in the case of pneumatic cleaning. The needle felt filter medium should be selected in accordance with the design of the filter unit and the cleaning system. Pneumatic cleaning methods (low or high pressure reserve air) meet the requirements of needle felts best. Practical examples of filter processes with fine dusts under varying working conditions demonstrate that every case of application is subject to its own laws.

38991 **APTIC NO. 62808**

Dupoux, Jean and Albert Briand

THE INFLUENCE OF PARTICLE SIZE AND RATE OF FILTRATION ON THE EFFICIENCY OF AIR FILTERS. *(Influence de la dimension des particules et de la vitesse de filtration sur l efficacite des filtres a air). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 24-1-24-14. 9 refs. (May 8-10.)*

The influence of the aerosol particle size and of the rate of filtration on the efficiency of porous-layer aerosol filters was studied according to the French Standard AFNOR X 44-011, using uranine as the tracer and the flame spectrophotometric method for concentration measurement. The filter efficiency was lowest for a particle diameter size of 0.1-0.15 micron. With the increase of the filtration velocity, the minimum efficiency shifted towards smaller diameters. The efficiency constantly decreased with the increase of the rate of filtration, except for particles over 0.2 micron in diameter; at filtration rates over 15 cm/sec, particle capture by inertia became prevalent. For particles of 0.1 micron in diameter, the efficiency is lowest for a filtration rate of 30 cm/sec, while for particles of 0.3 micron in diameter, the filtration rate giving the efficiency minimum was 15 cm/sec.

38992 **APTIC NO. 62425**

Eisenfelder, D. J. and J. W. Dolen, Jr.

AIR POLLUTION CONTROL CAN SAVE MONEY. *Chem. Eng. Progr., 70(5): 48-50, May 1974.*

A pharmaceutical plant to manufacture a nonnarcotic analgesic is being built which must meet air pollution control regulations. An environmental impact statement was developed to estimate present and future pollution. On-site bacteriological treatment will be a temporary water pollution control technique until a waste-water treatment facility is completed. In the existing factory, emissions are scrubbed with water. But since the new facility would require more water to scrub hydrogen bromide and methyl bromide adequately, several other control methods were developed. These include direct incineration, condensation, and solvent scrubbing. Various problems caused all alternatives to be rejected except for a combination of water scrubbing with solvent (alcohol) scrubbing. Four types of systems were studied in greater detail, and the two-stage, recycled spent HBr, recycled alcohol system was chosen. Because of the recycling of HBr, the pollution control system may provide a fine return-on investment rather than cost capital and operating monies.

38993 **APTIC NO. 62166**

Endo, Tetsuo

ODOR REMOVAL BY CATALYTIC OXIDATION. *(Shokubai sankaho ni yoru akushu jokyo). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(2):56-59, Feb. 1974.*

Catalytic oxidation deodorization makes it possible to burn gas at a low temperature. Most odorous materials are composed of organic carbons, hydrogen, and oxygen, and oxidation changes them into harmless, odorless carbon dioxide or water. By using catalysts, combustion at 250-400 C can achieve the same effect as combustion at 700-800 C without catalysts. There is an upper limit for effective catalytic oxidation depending on the concentration of gas. The limit is about 10-15 g/N cu m, or 0.2-0.7%. Most effective catalysts are precious metals such as palladium and platinum; less effective catalysts are vanadium, silver, chromium, copper, manganese, and white gold. Some organic compounds containing nitrogen and sulfur can be treated, but first catalytic poisoning elements must be examined. Such poisoning materials include lead, zinc, tin, mercury, organic metal compounds, organic silica compounds, phosphorus, arsenic, and halogen. When these materials exist in the gas, catalytic activities decrease drastically. In the treatment system, the treatment gas is led from the source through a duct to the system by a blower. A preheating burner heats the gas to an appropriate temperature. Thy heated gas passes over the catalytic element and goes out through the exhaust. After the treatment, the heated gas exchanges heat with untreated gas. When the concentration of combustible gas is high, the system can be operated without preheating. The system is suitable for industries such as paint and enamel manufacturing, ethylene oxide manufacturing, nitric acid manufacturing, sewage treatment plants, and the atomic reactor off-gas treatment system.

38994 **APTIC NO. 61784**

Eto, Hiroshi

NOX REMOVAL BY ABSORPTION. *(Kyushuho ni yoru NOx no jokyo). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(6): 556-561, June 1974.*

The removal of nitrogen oxides from industrial processing by catalytic oxidation using activated carbon, and by wet absorption is explained with diagrams, tables, and graphs. An actual case of NOx treatment by these methods developed by the Miura Chemical Co. for a steel manufacturer and used in the metal surface coating process is introduced. The system has a capacity of 400 cu m/min and the NOx elimination rate is about 90%. The system comprises a filter tank, a catalytic layer of activated carbon, the first absorption tower and the second absorption tower, an eliminator, the third absorption tower, a blower, two absorbent tanks with absorbents A and B, a pump, and a liquid waste pit. First, NOx gas created in the acid bath of the coating process is drawn by the blower and sent to the filter tank. The gas is oxidized in the catalytic oxidation activated carbon layer, and nitric oxide changes into nitrogen dioxide. The NO2 is absorbed in two absorption towers. The remaining NO-rich gas is absorbed by the absorbent B (oxidation absorbent), and the clean gas is emitted from the stack. The NOx concentration at the entrance is 1500-2000 ppm, and at the exit, 150-200 ppm.

38995 **APTIC NO. 62419**

Frost, A. C.

SLURRY BED ADSORPTION WITH MOLECULAR SIEVES. *Chem. Eng. Progr., 70(5):70-73, 1974. 5 refs.*

Fixed bed adsorption is widely used for gas purification, dehydration, and bulk separations. Thye performance of slurry bed adsorber systems can be enhanced with slurries containing molecular sieves. Their Langmuir-type adsorption isotherms result in higher average removal efficiencies than those obtained with slurries composed of adsorbents with linear isotherms. A theoretical study of gas phase efficiency and an experiment with a slurry adsorber showed that a slurry containing a molecular sieve with its Langmuir-type isotherm exhibits the expected operating characteristics of a slurry bed adsorption system and has the additional advantage of high gas-phase efficiencies at high loadings. This process can be used in the purification of various fuel gases.

38996 **APTIC NO. 62135**

Furuta, Shigeo

CONTROL MEASURES FOR, AND A REVIEW OF, NOX EMISSION BY COMBUSTION OF GAS. *(Gasunensho ni yoru NOx taisaku oyobi sono kosatsu). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(2):115-126, Feb. 1974. 15 refs.*

Typical air pollutants emitted by combustion of a fuel are oxides of sulfur, carbon monoxide, hydrocarbons, oxides of nitrogen, and dust. The most ideal fuel for reduction of air pollution is a gas fuel such as natural gas, city gas, or liquified petroleum gas (LPG). Emission of SOx with a gas fuel is 1/200 to 1/700 that of heavy oil fuel and 1/200 that of coal. Dust emission is 1/10 that of heavy oil and 1/38 that of coal while NOx emission is 1/22 that of heavy oil and 1/4 that of coal. Therefore, air pollution control measures involving use of a gas fuel are practically NOx control measures. A 1970 Environment Agency estimate indicates that automobiles account for 39% of the total NOx emission, thermal power plants for 21.5%, general industry for 31.0%, commerce and households for 2.6%, industrial wastes incineration for 0.8%, and the petroleum industry for 5.1%. Combustion system type affects NOx emission. A Canadian survey report shows that NOx emission is less with gas fuel than with oil fuel. A tangential firing system generally gives less NOx emission than a horizontal firing system. The NOx emission rates of various industrial heating furnaces using city gas fuel are tabulated. They range between 0.44 g/10 kcal for the box-type annealing furnace using a line burner and premixing combustion system and 1.73 g/10 kcal for the copper alloy cubicle furnace using an ED burner and semi-nozzle mixing combustion system. The NOx control measures discussed include low excess air combustion, exhaust gas recirculation, the water injection, and the multi- stage combustion.

38997 **APTIC NO. 62532**

Garrett, Ken

TURBOCHARGING THE PETROL ENGINE. *Engineering (London), 214(3):183-186, March 1974.*

Design considerations involved with turbocharging diesel and spark ignition gasoline engines are reviewed in terms of resulting increased engine efficiency and increased pollution control. The overall concept is to use waste energy in the exhaust, thus permitting the use of a small engine in place of a larger engine. Critical factors that are reviewed for consideration include: matching turbocharger to engine, compression ratio and octane requirement, and thermal and mechanical loading. Applications of turbocharging to three automobile engines are outlined, and a Ford V6 turbocharged engine is cited in which the output of nitrogen oxides is considerably lower due to exhaust recirculation.

38998 **APTIC NO. 61908**

Gebhardt, G.

REPORT FROM COMPANIES: UNITED POWER PLANTS WESTPHALIA AG (VEW). THE VEW COAL CONVERSION PROCESS IS SUPPOSED TO MAKE HARD COAL ECONOMICAL. *(Gesellschaftsberichte: Vereinigte Elektrizitaetswerke Westfalen AG. Das VEW-Kohle- Umwandlungsverfahren soll die Steinkohle wirtschaftlicher machen). Text in German. Glueckauf (Essen), 110(2):72-73, Jan. 1974.*

A new coal conversion process is described converting coal to power and gas with simultaneous desulfurization of the fuel. The pulverized coal dust is first oxidized without pressure, then rapidly degased and partially gasified. Oxidation has the advantage that the coal particles do not agglomerate so that any kind of coal can be used. The gas obtained bears the sulfur (as hydrogen sulfide) from the pulverized coal particles, which burst open to coke particles with very large surface. This sulfur is washed out in the gas desulfurizing plant and processed to obtain granulated sulfur. The fine coke which is not partially gasified is burned in the melting chamber of the steam boiler of the power plant. Part of the desulfurized gas is used as fuel for the gas turbine the waste gas of which (with high temperature and surplus oxygen) serves as primary air in the steam boiler at the combustion of the coke. The remaining gas is supplied to chemical plants and metallurgical plants as raw material, however it can also be used for power production.

38999 **APTIC NO. 62396**

Goodsel, A. J.

MERCURY PENETRATION POROSIMETRY IN ANALYSIS OF EXHAUST CATALYSTS AND CATALYST SUPPORTS. *Powder Technol. (Amsterdam), 9(4): 191-197, 1974. 9 refs.*

The application of mercury penetration porosimetry in the analysis of automobile exhaust catalysts and catalysts supports is described. Samples of honeycomb catalysts from different manufacturers were studied by this technique to investigate the loss of catalyst activity by high-temperature aging as correlated with pore structure alterations. It was possible to determine the difference between catalyst deterioration due to poisons deposited on the catalyst and deterioration due to loss of surface area resulting from extremely high temperatures. Some data are presented which indicate that, by choosing the proper conditions in the honeycomb fabrication purposes, the porosity of the resulting product can be controlled. (Author summary modified)

39000 **APTIC NO. 61714**

Gouldin, Frederick C.

THE GAS TURBINE AS A VEHICLE ENGINE. *Eng.: Cornell Q., 8(4): 15-22, Winter 1974.*

The gas turbine is potentially a superior choice for automotive use. Because of low maximum temperature, high excess air, and continuous combustion, very low emissions generally occur in gas turbines. Although the emissions are low, they do not yet meet expectations and do not meet standards. The combustor design can be changed to reduce emissions, however. The advantages and disadvantages of the gas turbine, combustion mechanisms, and the potential for reduced emissions are discussed.

39001 **APTIC NO. 62418**

Haase, D. J. and D. G. Walker

THE COSORB PROCESS. *Chem. Eng. Progr., 70(5):74-77, May 1974. 4 refs.*

A new COSORB process was developed to recover high-purity carbon monoxide and hydrogen-rich products from gaseous streams. The process is based on the solvent complexation of CO in a liquid solvent. The solvent has an aromatic base with an active component referred to as copper aluminum chloride (CuAlCl4). The process is essentially a simple absorption/desorption process for CO, similar to a carbon dioxide removal process. It has a substantial operating and capital advantages over competing processes such as the ammonical copper liquor system in separating CO from common synthesis gas streams. It has an even greater capital advantage over the most favorable cryogenic separation of CO and H2. Operating costs are competitive with the cryogenic system; however, the optimization of the new process with the synthesis gas manufacturing process is expected to substantially improve the operating economics of the COSORB unit. (Author conclusions modified)

39002 **APTIC NO. 62200**

Hamersma, J. W., M. L. Kraft, C. A. Flegal, A. A. Lee, and R. A. Meyers

APPLICABILITY OF THE MEYERS PROCESS FOR CHEMICAL DESULFURIZATION OF COAL: INITIAL SURVEY OF FIFTEEN COALS. (FINAL REPORT). *TRW, Inc., Redondo Beach, Calif., Systems Group, Environmental Protection Agency Contract 68-02-0647, ROAP 21AFJ-32, Program Element 1ABO13, Rept. EPA-650/2-74-025, 200p., April 1974. 11 refs.*

NTIS: PB 232083/AS

Run-of-the-mine coal samples were collected from each of 15 U. S. mines located in 11 states from New Mexico and Montana to West Virginia and Pennsylvania. Each coal was treated separately by the Meyers Process (ferric sulfate extraction) and float-sink fractionation (physical cleaning). The Meyers Process removed 83-99% of the pyritic sulfur (40-64% of the total sulfur) from all of the coals which contained sufficient pyritic sulfur for accurate sulfur determination (i.e., greater than 0.3% w/w). Four of the coals were reduced to less than 1% total sulfur by the Meyers Process, while one of the coals was reduced to less than 1% total sulfur by physical cleaning (1.90 float material, 14 mesh by 0). With the exception of one mine, the Meyers Process removed significant to very large increments of sulfur over that separable by physical cleaning. Significant amounts of arsenic, beryllium, chromium, manganese, nickel, selenium, and zinc were removed along with the pyrite by the Meyers Process. (Author abstract)

39003 **APTIC NO. 62885**

Hannes, K., H. Janz, and P.-H. Bruns

TRANSREGIONAL REMOTE HEATING - A MODEL. *(Ueberregionale Fernheizungein Fernheizung-ein Modell). Text in German. Tech. Mitt., 67(5):180-186, May 1974. 8 refs.*

Based on the fact that today in the Federal Republic of Germany about 25% of the total primary energy is consumed for home heating and that light fuel oil covers 65 per cent of this demand, a new trans-regional model for remote heating is discussed. It uses the enormous quantities of waste heat which are now produced by power plants and incinerators for remote heating. This waste heat could, for example, be supplied to a remote heat supply line which might run through the Ruhr valley from Dinslaken to Dortmund. The two power plants in Dinslaken and Herne alone could cover the basic heat demand in the Ruhr area on the basis of hard coal. Technically the model could be realized. Decisive for the economy of such a remote heating system are the fuel prices and the investment costs. According to a preliminary estimate, trans-regional remote heating networks are worthwhile at heat prices of more than $4.37/Gcal.

39004 **APTIC NO. 62767**

Hansen, Hans Christian and Edwin Jensen

EXHAUST EMISSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) Brit. Pat. 1,345,143. 5p., Jan. 30, 1974. (Appl. July 29, 1970, 6 claims).*

An exhaust emission control device for internal combustion engines was developed. It provides for supply of additional air to the intake manifold when the engines run idle or at low speed, especially during periods of deceleration. The device significantly reduces the carbon monoxide and unburned hydrocarbon content of the exhaust gases. A car without the device was made to achieve a low CO output by leaning the fuel/air combustion mixture, but as a result, the engine misfired and an increase in the output of unburned hydrocarbons was measured. When the idling speed control was increased to prevent the engine from stalling, the driveability of the vehicle was not impaired. Cars fitted with the device conform to the U. S. Federal cycle tests (hot cycles).

39005 **APTIC NO. 62845**

Hardt, Lothar, Heinz Muller-Wartenbert, and Hans Rauschenberger

TUBE-TYPE ELECTROSTATIC PRECIPITATOR. *(Metallgesellschaft Aktiengesellschaft, Frankfurt-on-the-Main (Germany)) Brit. Pat. 1,344,560. 8p., Jan. 23, 1974. (Appl. June 28, 1972, 13 claims).*

A tube-type wet electrostatic precipitator was developed. The tubes have an artificially roughened internal surface with a minimum roughness of 15 microns and are composed of a synthetic resin sleeve externally reinforced by a covering of a synthetic resin containing glass fibers. The covering is preferably in the form of bands wound helically around the tube. The interior of each of the tubes may be roughened by treatment by sand blasting or some other material removal or forming technique to impart a roughness to the interior surface. The interior of the tube overcomes the corrosive nature of the gas which has been the main problem in wet precipitators. Neither metal coated synthetic resin tubes nor tubes containing a film of conductive liquid have solved the corrosion problem.

39006 **APTIC NO. 60001**

Hashida, Isao and Masato Nishimura

SYNTHESIS OF POROUS RESIN AND ITS APPLICATION (II). *(Takosei jushi no gosei to sono oyo). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.). 48(3):80-85, March 1974. 14 refs.*

The porous resin is primarily used as an ion exchange resin. Because of its active surface and high porosity characteristics it is also being considered for use as an adsorbent for nor polar organic molecules, colored organic macromolecules di solved in waste water, and gases. It is widely used as a st tionary agent in gas and liquid chromatography. Gases fo which the resins can be used as an adsorbent include hydrogen sulfide, mercaptans, sulfurous acid, nitrogen oxides, and ammonia. They are also used in sewage deodorization.

39007 **APTIC NO. 61894**

Hashimoto, Yukio and Shigeru Doi

PURIFICATION METHOD FOR GAS EMITTED FROM OIL STORAGE TANK. *(Tanku haishutsugasu seijol hoho). Text in Japanese. (Nippon Oil Co., Ltd., Tol (Japan)) Japan. Pat. Sho 49-10324. 4p., March 9, 1974 ref. (Appl. Sept. 30, 1968, 1 claim).*

A method designed to dispose of evaporation gases emitted from a fixed-capacity petroleum oil storage tank is described. When such a tank is not full, harmful gases such as hydrogen sulfide and mercaptans which are emitted from the oil accumulate above the surface level of the oil. Such gases are discharged when an additional supply of the oil is put into the tank. In this method, the gases are removed through an outlet in the upper part of the tank, and scrubbed with an alkaline water solution for particle removal of mercaptans and nearly complete removal of H2S. The gas is then placed in contact with another alkaline water solution to oxidize the remaining mercaptan. A hydrocarbon in the alkaline water solution removes the disulfide formed by oxidation of the mercaptans.

39008 **APTIC NO. 62114**

Hayashi, Taro

DUST-COLLECTING HOOD. *(Shujin huudo). Text in Japanese. Preprint, Japan Society of Materials Science, Kyoto, p. 155-166, 1974. (Presented at the Symposium on Pulverization and Dust Control, Kyoto, Japan, Feb. 20-21, 1974.)*

The Dalla Valle method of designing a dust-collecting hood is questioned as to its effectiveness. The chief design factors considered in the Dalla Valle method are: the dust should be collected within its scattering limit, the gas flow in the hood produces a synthetic vector which affects each dust particle, the equal-velocity lines should be calculated theoretically and experimentally, dimensions of a required hood are determined by considering the above factors, and the control wind velocity should be determined by considering conditions of the generated dust and gas. In an effort to clarify many questions associated with the conventional hood design method, various factors affecting a dust-collecting hood were theoretically and experimentally analyzed and a new design method which may be called the Flow Ratio Method was synthesized. The findings supporting the new method are all discussed and illustrated.

39009 **APTIC NO. 62154**

Henkel, Hans-Joachim

CATALYTIC CRACKING OF HYDROCARBONS IN A COMPACT GAS GENERATOR. *(Katalytische Kohlenwasserstoffspaltung in einem kompakten Gasgenerator). Text in German. Erdoel Kohle-Erdgas- Petrochemie, 27(5):251-254, May 1974. 6 refs.*

The emission of noxious products from combustion engines can be improved if, instead of a liquid fuel, a gas is fed to the engine. A suitable process of gasification and a compact gas generator which can be fitted into a motor car are described. The reduction of the emission of noxious products was measured in a series of tests. The gas generator comprises a reaction chamber containing a specially developed catalyst for gasoline cracking. The gas coming from this reaction chamber is passed through a deflection shaft to a counter current heat exchanger and is cooled by heating up air and gasoline. The gasoline quantity is controlled by electromagnetic injection valves. The air inlet is dimensioned to permit entry of the adequate amount of combustion air. The obtained gas enters the combustion system by way of a mixer where the required amount of air is mixed with the gas. Since now a most complete combustion is desirable, lambda may exceed the stoichiometric value of one. The gas generator was tested with various four-cylinder engines. At partial load operation of a water-cooled 2 liter engines for both gasoline and gas operation the fuel consumption was 6 kg/hr, and the revolution number was 3000 rpm. As fuel for gas operation, straight-run gasoline with an octane number of 60 was used. The same fuel consumption and the same power were obtained for lambda 1 at gasoline operation and lambda 1.2 at gas operation. In this case with gas operation the CO emission went down to 1/16th, and the nitrogen oxides emission to 1/35th of the emission with gasoline operation.

39010 **APTIC NO. 62553**

Herr, G. A.

ODOR DESTRUCTION: A CASE HISTORY. *Chem. Eng. Progr., 70(5): 65-69, May 1974.*

A case history is presented of odor control attempts at an antibiotic manufacturing plant. Incineration was the method finally decided upon after several trial-and-error attempsts with various odor abatement systems. The use of dome-shaped covers was employed to successfully abate odors from filters converted to aeration tanks, and extra lengths of duct were used to pick up foul air from a continuous centrifuge and deliver it to the incinerator. A second gas-fired incinerator is currently being installed to handle increased antibiotic manufacture, and odor destruction capacity with the addition is expected to be 93,000 std cu ft/min of foul air.

39011 **APTIC NO. 62083**

Hoffman, L., J. B. Truett, and S. J. Aresco

AN INTERPRETATIVE COMPILATION OF EPA STUDIES RELATED TO COAL QUALITY AND CLEANABILITY. (FINAL REPORT). *Mitre Corp., McLean, Va., Environmental Protection Agency Contract 68-02-1352, Proj. ROAP 21AFJ-27, Program Element 1AB013, Rept. EPA-650/2-74-030, 276p., May 1974. 30 refs.*

NTIS: PB 232011/AS

An interpretative compilation is given of the overall Environmental Protection Agency coal cleaning effort in the form of indepth analysis, evaluation, and examination of the interrelationships among elements comprising the EPA coal program. Coal washability studies, sulfur reduction by cleaning processes including plant design and associated economics, and the utilization of reject sulfur and coal values from the cleaning processes are described. (Author abstract)

39012 **APTIC NO. 61825**

Iida, Akira and Toru Taniguchi

TOXIC GAS ADSORPTION SYSTEM. *(Yudoku gasu kyuchaku sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-14988. 12p., April 11, 1974. (Appl. Dec. 22, 1969, 1 claim).*

The device described is an adsorption system for toxic and radioactive gases and is effectively applicable for sulfur dioxide, nitrogen dioxide, carbon monoxide, nitric oxide, hydrogen sulfide, ammonia, chlorine gas, tetraethyl lead, hydrocarbons, and carcinogenic hydrocarbons. The adsorption chamber has a gas passage in the center and a passage for ultra-dissociated asbestos suspension liquid, and these passages are disconnected with a partition board. However, in the middle of these passages is a horizontal stirrer bar and a fixed ring with a rotation brush of stainless steel fiber or synthetic fiber. The asbestos suspension liquid is filled up to the lower end of the gas passage. The rotation brush is rotated at a high speed half in the flowing gas and half in the suspension liquid. It was confirmed that the rate of gas adsorption is greater with a greater amount of dissociated asbestos in the liquid, and in general, the smaller the dispersing bubbles of gas, the better the adsorption. Generally, the best results were obtained when the gas particles were less than 1 micron and the rate of dissociated asbestos was about 45%.

39013 **APTIC NO. 62558**

Inaba, Hideya

FLUE GAS DENITRIFICATION TECHNOLOGY. *Chem. Economy Eng. Rev., 6(2)(No. 70):53-59, Feb. 1974. 4 refs.*

Flue gas denitrification processes developed by the Hitachi Shipbuilding and Engineering Co., Ltd. are outlined for stationary combustion sources. The processes are of the nonselective, semiselective, and selective catalytic reduction type. Tests at a pilot plant indicate that if appropriate reaction conditions are selected, the concentration of nitrogen oxides cr be reduced to less than 10 ppm with the aid of any of the catalysts developed, regardless of whether sulfur oxides are present. Reliable data are not yet available, however, about catalyst life, and nothing is known about the effect of gaseous impurities found in waste gases. A flowsheet is presented for a complete flue gas purification system which includes dust removers, a sulfur dioxide absorbent, and a reduction catalyst for denitrification.

39014 **APTIC NO. 61901**

Inaba, Minoru

THE STATE OF POLLUTION CONTROL TECHNIQUES RESEARCH AND DEVELOPMENT IN VARIOUS TEST AND RESEARCH FACILITIES OF THE AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY. *(Kogyo Gijutsuin shiken kenkyu kikan ni okeru kogai boshi gijutsu no kenkyu kaihatsu no genjo). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(1):2-9, Jan. 1974.*

Approximately $20,000,000 were spent by the Agency of Industrial Science and Technology in 1973 on pollution studies. The research and development was carried out at 15 centers in the country. Air pollution studies in 1972 and 1973 include automotive exhaust gas studies, control methods, development of non-polluting automotive engines, flue gas diffusion studies by wind tunnel experiments, emission preventing techniques of nitrogen oxides from fixed sources, development of catalysts, asphalt decompositon techniques, asphalt utilization technique, removal of offensive odors by polymer materials, offensive odor prevention by fluidized bed techniques, air pollutant measurements, and physical methods for the detection of small quantities of harmful air pollutants. Remarkable progress was achieved on high performance batteries for electric cars.

39015 **APTIC NO. 61779**

Inoue, Koichi and Toshio Ohira

EVALUATION OF AUTOMOTIVE EXHAUST GAS ATTENUATION DEVICES. *(Jidosha haiki gasu gensho sochi no hyoka). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 5:44-50, March 1974. 3 refs.*

Seventeen market-sold automotive exhaust gas attenuation devices were classified into five categories, and a representative device in each category was examined to determine the effectiveness of each type. The five types were: a supplementary air supply type, an additive containing air supply type, a water supply type, a modified engine type (manifold), and another modified engine type (secondary voltage stabilization type). Exhaust gases were tested by placing a domestic car with a 1600 cc engine with four gears on a chassis dynamometer, and leading part of exhaust gases in four driving modes to the analyzer. Carbon monoxide, hydrocarbons and nitrogen oxides were measured. From the standpoint of controlling contributory factors to photochemical smogs, the engine modification (manifold type) was the best, but this type of device decreased the acceleration performance, and caused plug burning, damages in the internal works of engine, and the engine was less durable. The secondary voltage stabilization type was without any effect. The supplementary air supply type decreased CO, but not much of HC, and increased NO emission. The additive containing air supply type was less effective in decreasing CO, and slightly more effective in decreasing HC, but had no effect on NO. The water supply type did not decrease CO as much as the above two methods, increased HC greatly, and decreased NO emission by 50%.

39016 **APTIC NO. 61872**

Isahaya, Norio and Tadashi Mizuno

DETECTOR DEVICE FOR ARC SHORTING OF ELECTROSTATIC PRECIPITATOR. *(Denki shujinki no denko tanraku kenshutsu sochi). Text in Japanese. (Hitachi Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-5708. 6p., Feb. 8, 1974. 1 ref. (Appl. Dec. 6, 1968, 1 claim).*

Unlike spark flashover which is a momentary breakdown of insulation, arc shorting is a continuous discharge or permanent shorting. For the optimum performance of an electrostatic precipitator, therefore, it is necessary to have a detector that can distinguish any arc shorting from spark flashover very quickly and transmit a control signal for extinction of the equipment or an alarm signal. Taking advantage of the discharge characteristic of the electrostatic precipitator that differs between spark flashover and arc shorting, the device described herein determines the event by detecting the primary-side voltage of the high-tension transformer and the load current. It consists of a means to take out the primary-side voltage of the transformer and a means to give non-linear output according to the magnitude of the current flowing between the electrodes, and is designed to indicate the arc shorting assumed to have taken place when the ratio between the first output and the second exceeds a specified level.

39017 **APTIC NO. 62521**

Ishiguro, T.

MEASURE FOR PROTECTION OF ODOR - ON THE PROTECTION TECHNIQUES. *(Akushu kogai boshi taisaku - bojo gijutsu towa). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(13): 1-6, Jan. 1974. 10 refs.*

Four main techniques for deodorization have been described. The characteristics of the burner and the structure and materials of the furnace are important to the combustion method. The burning apparatus must be selected to fit the kind of flame, the burning temperature, the mixing of gas, and the holding time required. When the adsorption method is used, removal of dust, mist, and tar material, adsorption amount, desorption temperature, surface area of adsorbent, problems due to adsorption heat, and the technique for reproduction must be considered in selection of adsorbents. The catalytic oxidation method is useful for special gases. Considerations of catalyst poisoning and explosion limit concentration are important. For the washing method, the selection of washing machine, examination of the gas-liquid contact method, the treatment of washing liquid after its use, and mechanism of automatic control of the machine are important. For example, the oxidation deodorization using chlorine dioxide produced from chlorine will be a useful method and should be examined in detail. Many practical examples are described for the food industry, organic solvents, livestock, and drainage.

39018 **APTIC NO. 61785**

Ito, Ko

IMPROVEMENT OF DUST COLLECTOR. *(Atarashi shujin sochi no doko). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(2):49-53, Feb. 1974. 13 refs.*

To meet stringent requirements in air pollution regulations and to satisfy demands for low cost performance and lower energy operation many improvements in dust collectors are required. Techniques that can reduce outlet dust concentration to 0.01 g/N cu m are necessary. With regard to aerosols, the ability to collect submicron dust (down to 0.1 micron) must be developed. The best performance now comes from dry dust collectors. However, they cannot be used to collect dusts of high or low resistivity. These shortcomings can be overcome by widening the distance between discharge electrode and collection electrode from 100-175 mm to 200-500 mm. By this modification 0.014 g/Ncu m of outlet dust was attained and the cost of maintenance was lowered. When the one stage wet collector was combined with (behind) a dry electic dust collector excellent results were obtained. Dust concentration was decreased to 0.01-0.06 g/N cu m in three cases. Moreover, 50-90% of sulfur oxides were removed by this combination. Dust of submicron size is collected very efficiently at the wet collector stage. Slurry from the wet collector is mixed with powdery dust from the dry collector. For bag filters, application of silicon filaments to the filter increased its lifetime.

39019 **APTIC NO. 62125**

Iwabuchi, Bin

POLLUTION CONTROL FOR COATING INDUSTRY. *(Tosogyokai no kogai boshi). Text in Japanese. Toso to toryo (Finish Paint), no. 3(51-58), March 1974.*

A general discussion is given on control of organic solvents in the surface coating industry. The absorption method using water and surface active agents capable of decreasing the surface tension of the organic solvents is the most promising method at the present time. The absorbents not only have washing ability but also can stabilize the emulsion-dispersion of the solvents and form a protective colloid. The absorbent is sprayed from the top of an absorbing tower where the solvents are collected by gas-liquid contact. Turbulent flow of the mixture caused by high flow velocities of the absorbent and flue gas promotes the formation of the protective colloid which separates into the layers at the bottom of the tower upon standing. The solvents in flue gases from the surface coating industry are usually esters, alcohols, ketones, and hydrocarbons. A high performing absorbent, Histop, has been shown to be very effective in solvent removal.

39020 **APTIC NO. 61772**

Kadel, H. P.

OPERATION OF THE NEW 3000 TONS/DAY KILN PLANT AT THE SCHELKLINGEN CEMENT WORKS: EXPERIENCE GAINED IN THE EARLY STAGES. *(Betrieb und erste Erfahrungen mit der neuen 3000 t/d-Anlage im Zementwerk Schelklingen). Text in German. Zement-Kalk-Gips (Wiesbaden), 27(3):111-117, 1974.*

Operating results obtained with a 3000 tons/day rotary kiln plant equipped with preheater and planetary cooler are reported. Some significant operating data for the preheater-equipped rotary kiln give an idea of the performance of this plant. Its operational behavior is described in detail, with special reference to preheater efficiency, coating problems, and experience and results obtained with the natural gas/heavy oil combined firing system. The operating performance of the planetary cooler is analyzed and summarized in a balance sheet. Problems of cooling tube mounting, refractory lining, and the behavior of lifter scoops and cooling tubes under high thermal and mechanical loading are considered. In this context the functioning of an installed temporary air cooling system is described, and results relating to clinker discharge temperature measurements are presented. Measurements of the dust concentration in the cleaned gas behind the electrostatic precipitator yielded a dust concentration lower than the nominal values. The evaporation coolers used for conditioning of the waste gases ahead of the filter operate well over a wide temperature range. When very large quantities of water are injected the dusts tend to get too wet. Experiments are now under way concerning improvement of the flow distribution, optimum injection method, and reduction of waste gas temperature.

39021 **APTIC NO. 61870**

Kahl, Dieter and Dieter Graf

SYSTEMATIC MONITORING OF THE AVAILABILITY AND THE DUST EMISSION OF ELECTROSTATIC PRECIPITATORS IN POWER PLANTS. *(Systematische Ueberwachung der Verfuegbarkeit und des Staubauswurfes bei Elektrofiltern in Grosskraftwerken). Text in German. Energietechnik, 24(3):101-104, March 1974. 4 refs.*

The availability of electrostatic precipitators is defined and used as a criterion characterizing for their quality of operation. The availability is understood as the ratio of average operating time of the cells of a precipitator to the time (within a certain reference period) the operation of the filter is required. By approximation the average collection efficiency of an electrostatic precipitator can be determined from the operating times of the individual cells. A detailed description of the applied approximation is given elsewhere. On the basis of the operating times of filter cells recorded over a period of one year in eight power plants the average long-term collection efficiency was determined with the approximation method. Precipitators which had been designed for a collection efficiency of 94 to 96% had an average long-term collection efficiency at continuous operation of the power plant of 57 to 91%. This drop of the average long-term collection efficiency was found to be largely due to the unsatisfactory ash tap-off. The mathematical relationships of the method were programmed for a computer (R 300).

39022 **APTIC NO. 62380**

Kaneko, Yasuo

THE LOW NOX MEASURES BY MITSUBISHI AUTOMOBILE CO. *(Mitsubishi de no NOx teigen taisaku ni tsuite). Text in Japanese. Preprint, Japan Automobile Technical Assoc., Tokyo, p. 265-270, 1974. (Presented at the Japan Automobile Technical Association Lecture Meeting, Tokyo, Japan, May 1974, Paper 36.)*

Exhaust gas recirculation (EGR), its effectiveness in controlling nitrogen oxide emissions, and research efforts towards future catalytic converter systems for meeting more stringent regulations are discussed. Some NOx formation factors and the effects of EGR are discussed. The concentration of NOx decreases with the increase of oxygen and reaches a maximum point when oxygen is 60% and nitrogen is 40%. But if oxygen increases and nitrogen decreases less than 40%, the NOx also decreases. The air-fuel ratio should be as lean as possible and spark timing should be delayed, but from the standpoint of fuel economy, MBT is more effective. Hydrocarbons increase with the increase of EGR. The CO is determined by air-fuel ratio, and spark timing delay does not affect it.

39023 **APTIC NO. 61935**

Kanematsu, Sadao

AIR POLLUTION CONTROL IN GLASS INDUSTRY. *(Garasu kogyo ni okeru taikiosen boshi taisaku). Text in Japanese. Seramikkusu (Ceramics), 9(1):49-55, Jan. 1974.*

In the processes of glass production pollutants like sulfur oxides, nitrogen oxides, poisonous compounds, and dust are emitted. The allowable amounts of these products are regulated by laws issued by the central government or by contracts made between the local governments and the manufacturers. Sulfur oxides produced by combustion of heavy oil and pyrolysis of mirabilite are removed by wet desulfurization (Evergreen method) or dry desulfurization methods. In either case sulfur oxides are absorbed by sodium hydroxide solutions and oxidized by air, and then recovered as mirabilite. The desulfurization rate is better than 97% in the wet method and 80-90% in the dry method. In factories of the Asahi Co., Ltd., installations handling 370, 70, and 280 kcu m/hr of SOx-containing gas are operated. Fluorine compounds exhausted during glass production are handled by two methods. In the dry method fluorine reacts with lime or alumina and 99.5% of the fluorides are removed by a bag filter lowering the contents in exhaust gas to below 1 mg/Ncu m. In the wet method fluorides are absorbed by sodium hydroxide solutions to give a removal rate of better than 97% and a fluoride content of below 1 mg/Ncu m. No effective process has yet been obtained to remove nitrogen oxides, although concentrations in the exhaust gas from the melting furnace are from 310-1400 ppm. An electric melting method is now being investigated to solve pollution problems in the industry.

39024 **APTIC NO. 61839**

Kasahara, Koji

ANTI-POLLUTION MEASURES IN MURORAN OIL REFINERY OF NIPPON OIL COMPANY. *(Nippon Sekiyu Seisei Muroran Seiyusho no kogai taisaku ni tsuite). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 27(87):26-29, Feb. 1974.*

Control measures at the Muroan oil refinery, which has a capacity of 110,000 barrels/day, are described. To remove sulfur dioxide in stack gases from the furnace and electricity-generating boiler, an indirect desulfurization system is used to produce heavy oil containing less than 0.8% sulfur. The sulfur in the petroleum is reacted with hydrogen to produce hydrogen sulfide, which is eventually recovered as pure sulfur. Stacks 180 m high disperse pollutants more effectively. Mixed naphtha combustion equipment reduces nitrogen oxides 40%. Storage tanks for crude oil and naphtha are equipped with floating roofs which prevent hydrocarbon emissions. Odorous sulfur compounds such as mercaptans and hydrogen sulfide are treated by hydrogenation and sulfur by-product recovery.

39025 **APTIC NO. 62115**

Kashiwayama, Saburo and Toshio Irie

ANTI-FLUE GAS AND WASTE WATER MEASURES IN WASTE INCINERATING FACILITIES. *(Gomi shokyaku shori shisetsu no haigasu, haisui shori taisaku no hoko ni tsuite). Text in Japanese. Toshi to Haikibutsu (J. Solid Wastes), 4(3):15-29, March 1974.*

The properties of flue gas discharged from waste incinerating facilities vary with the quality of wastes, type of combustion, method of cooling flue gas, method of collecting dust, and many other factors. Most of the hydrogen chloride emitted from waste incinerating facilities is due to the combustion of waste plastics, and the emission level of the hydrogen chloride is altered in the range from 10 to several hundred ppm, according to operating variables. The main purpose of treating flue gas in waste incinerators is to remove hydrogen chloride, although sulfur oxides and heavy metals can be partly removed in this treatment process. Absorption methods for harmful gases are roughly divided into dry and wet treatments, but at the present time the wet type is most adaptable. In the selection of a treatment process for flue gas, it is advisable to adopt the most appropriate system for the type of waste incinerating facilities. The treatment of flue gases in a continuous combustion incinerator provided with a boiler, for example, is outlined. In this treatment process, flue gas coming out of dust collectors goes to a cooling and absorption tower and is reheated to about 180 C for discharging into the air.

39026 **APTIC NO. 61927**

Kato, Tsutomu, Osamu Hirao, and Yoji Umetani

INDOOR AIR CLEANER. *(Okunai kuki joka sochi). Text in Japanese. (Kachita Co., Ltd., Hamamatsu (Japan)) Japan. Pat. Sho 49-11141. 4p., March 15, 1974. (Appl. April 27, 1970, 1 claim).*

Designed for use in an underground or indoor garage or parking lot where carbon monoxide and other harmful contents of the exhaust gas are likely to accumulate to a high concentration, an air cleaner using filters and a catalyst capable of keeping the CO and sulfur dioxide concentrations at a level below 10 ppm and 0.5 ppm, respectively, is described. The cleaner features two dehumidifers which are incorporated in the system so that they may be operated cyclically. A metal or glass wool filter which collects lead and other dust particles in the air is installed in the intake port of the cleaner. Immediately inside the intake port is a suction blower which is connected to the adsorption tank of active carbon. An oxidation reaction tank packed with a granular catalyst of copper and manganese oxides is used. The two dehumidifiers have electric heaters which are used to dry the silica gel contained in the dehumidifiers. The service life of the oxidation catalyst can be prolonged remarkably when used in air whose relative humidity is below 70%. A alternate operation of the two dehumidifiers allows regeneration of the desiccative.

39027 **APTIC NO. 62168**

Kawano, Takashi and Takasumi Niwa

GASIFICATION DESULFURIZATION OF HEAVY OIL. *(Jushitsuyu no gasuka datsuryu). Text in Japanese. Nihon Kikai Gakkai-shi (J. Japan. Soc. Mech. Eng.), 77(663):107-111, Feb. 1974. 9 refs.*

The Ube process of fuel desulfurization comprises gasification and desulfurization. The gasification furnace has three parts: the upper quencher, the middle normal decomposition furnace, and the lower high temperature decomposition furnace. Each part has a fluidized bed. The by-product heavy oil separated in the desulfurization scrubber and by-product carbon from the cyclone are sent to the high temperature furnace by forced recirculation together with steam and oxygen and the fuel is completely gasified at the high temperature of 1100-1200 C. The gas goes to the upper normal temperature furnace together with part of catalyst particles. There, the catalysts are fluidized. Residual oils from normal pressure and reduced pressure are sent to this furnace together with steam and oxygen, and the fuel oil is decomposed at 800-900 C. The decomposed gas and some particles (catalyst) are sent to the quencher; here the gas is cooled drastically by atomized heavy oil supplied from the bottom of the quencher. The fluidized catalysts for the two furnaces are the same inorganic oxides particles, and they are covered by carbon and heavy substances in the quencher. These particles are sent to the high temperature furnace and are gasified together with heavy oil and carbon supplied by scrubber and cyclone. The gas going out of the quencher is led to the scrubber where carbon and other solid substances are washed off. The gas goes to the distillation tower and is separated into gas, light oil, and heavy oil. The heavy oil is recirculated back to the high temperature furnace. The light oil can be gasified or easily hydrodesulfurized and made into low-sulfur fuel oil. The gas from the distillation tower contains hydrogen sulfide gas and a small amount of sulfur dioxide. This is sent to the treatment tower and SO_2 is eliminated by ammonia. Hydrogen sulfide is eliminated by potassium carbonate solution in the absorption tower and is refined into fuel gas.

39028 **APTIC NO. 62185**

Kice, Russell W.

DUST CONTROL BASICS. *Feedstuffs, 46(10):44-45, March 11, 1974. (Presented at the Oregon Feed, Seed, and Suppliers Association 1974 meeting, Portland.)*

The problems of dust collection in a dust control system are discussed. Dust control consists of preventing the fine particles from escaping out of a machine enclosure or system into the work areas and into the atmosphere. The emphasis is on better enclosures to contain dust, on tight spouting, and on conveyors that operate slowly enough to eliminate fine particles from the surrounding atmosphere. Due to environmental concern, the dust collector is of prime importance in a dust control system. The cyclone type separator when properly sized and designed has a lot of favorable characteristics. However, the system can be operated with stock outlet choked down and all dust blowing to the atmosphere. This has caused the environmentalists to arbitrarily rule most systems using cyclone type collectors for removal of fine dust particles as in violation of the standards. The problem is being solved by the installation of cloth filter collectors, either as secondary collectors following the primary cyclones or as the primary collector. The primary cyclone should be used to eliminate 98+% of the dust in the system and return this dust back to the system. The air and -2% of the dust can then be directed to the filter for final cleaning and releasing back to the building or to the atmosphere.

39029 **APTIC NO. 62518**

Kiuchi, S.

COUNTERMEASURES FOR NOX. *(Chisso sankabutsu taisaku). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 25(2):193-198, Feb. 1974.*

Boilers for electric generators emit 102-960 ppm of nitrogen oxides depending on the type of fuel used. The amount of NOx emitted from boilers increases with the fuel used in the order city gas, heavy oil, and coal. To reduce the emission of NOx, the content of O_2 should be reduced, the rate of combustion should be slow down to make the temperature of combustion lower, the exhausted gas should be returned to the boiler by the mixing with the air or by introduction to the furnace directly, or two-stage combustion should be used. For heavy oil boilers, a reduction of 20-40% of NOx was obtained using two-stage combustion and eeexhausted gas mixing. For coal boilers, 25% reduction was obtained using two-stage combustion method. For new boilers built with consideration of NOx reduction, NOx concentration is estimated to be 150-480 ppm. The present problems in countermeasures for NOx are the instability of combustion, the increase of uncombusted portions, and local heating. The best way to reduce NOx is to reduce the nitrogen content in fuels. The technique of reducing NOx in the exhausted gas is not sufficient.

39030 **APTIC NO. 62608**

Kobayashi, Manabu, Hiromichi Hara, Hiroshi Shitamude, and Mitsuo Uchino

HC EMISSION BY WHIRLPOOL CHAMBER DIESEL ENGINES. *(Karyushitsushiki dizeru enjin no HC emission ni tsuite). Text in Japanese. Preprint, Japan Automobile Technical Assoc., Tokyo, p. 153-160, May 1974. (Presented at the Japan Automatic Technical Association Lecture Meeting, Tokyo, Japan, May 1974, Paper 24.)*

Causes of hydrocarbon emissions by diesel engines and control measures were investigated using two types of whirlpool chamber diesel engines. High HC emission at high speed and medium and high loads is caused by the secondary and tertiary fuel injection (subsequently referred to as delayed injection) at crank angles larger than 40 ATDC, which can be reduced considerably by eliminating the delayed injection. The primary cause for high HC emission at low load range is the delay at the onset of fuel injection and irregular injections caused by the decrease in residual pressure. Generally, the control measure for delayed injection works against the control for irregular injection. However, it is always important to properly adjust the balance between the rate of fuel pumping and injection rate at nozzle, and to regulate the residual pressure. The HC emission at low load can also be controlled by reducing idle capacity in the injection nozzle, increasing compression ratio, and providing the proper connection area to side chamber.

39031 **APTIC NO. 61830**

Kobe, Ryuzo and Michihiko Fukakusa

MANUFACTURING METHOD OF PALLADIUM CATALYST FILTER. *(Parajiumu shokubai firuta no seizo hoho). Text in Japanese. (Tamachi Denki Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-5113. 3p., Feb. 5, 1974. (Appl. Sept. 25, 1969, 1 claim).*

A new method for manufacture of catalytic palladium-carbon air filters without subsequent corrosion of the furnace used is presented. The method features the use of palladium oxalate, the reduction and deposition of which generates only steam, carbon dioxide, and carbon monoxide, none of which are corrosive. Another feature is the use of a carbon fiber as the carrier. This is produced by a carbonization process consisting of heating synthetic fibers (rayon or polyacrylonitrile) in an air current for 10 hr. The product is a carbonaceous material which is insoluble even in the solvent for the original fiber material and provides sufficient strength and flexibility for use as an incombustible filter layer.

39032 **APTIC NO. 62120**

Koerbel, Wilhelm

TRASH AS FUEL. *(Muell als Brennstoff). Text in German. Energie Tech., 26(2):31-35, 1974.*

The annual trash quantity in the Federal Republic of Germany is approximately 21.65 million tons. The lower heating value on the average is 1800 kcal/kg, which yields a total gross heat quantity of 38.9 Gcal/yr. Households in the FRG consume 48.6 million MWh of electricity. From the heat of trash incineration about 6.53 MWh can be generated which is about 13.4%. The heat consumed by households in the FRG amounts to 274.0 million Gcal/yr. After subtracting all losses, 20.6 million Gcal/yr or 7.5% can be covered by waste heat from trash incineration. Based on present oil prices, trash has a value of 8 million dollars/yr if converted to electricity and a value of 18 million dollars/yr if used for remote heating. Some typical examples of incinerators with heat utilization are given. The Duesseldorf incinerator was erected in the neighborhood of the municipal power plant. The incinerator receives the feed water from the power plant. It is equipped with a steam boiler which supplies the power plant with steam for power generation and remote heating. The incinerator in Essen-Karnap has been integrated into an already existing power plant. The incinerator of Stuttgart Muenster burns 20 t/hr of trash. In addition, it is fired with oil to obtain a total quantity of 125 t/hr steam at 77 atm gauge and 510 C. The combustion chambers for oil and trash are separated. Another 600 MW unit has three incinerators each with a capacity of 20 t/hr. The incinerator section serves for preheating the feed water for the 600 MW unit. Between the power plant and incinerator is only one connection on the feed water side and the joint stack. The separation of the flue gases of the incineration section from those of the power plant has the advantage that the cleaning of the incineration off-gases from dust and chemical pollutants remains confined to these gases. A scrubbing system is installed ahead of the stack for cleaning these gases. There are also incinerators in the FRG which are the sole basis for power generation without auxiliary units fired by oil or gas. A final example for heat utilization in incinerators is the incinerator in Krefeld which generates its own power, supplies heat for remote heating, and supplies heat to aid the sewage sludge incineration.

39033 **APTIC NO. 62148**

Koglin, Waldemar

THE DUST COLLECTION IN THE ELECTROSTATIC PRECIPITATOR. *(Die Staubabscheidung im Elektrofilter). Text in German. Staub, Reinhaltung Luft, 34(5):172-175, May 1974. 4 refs.*

In order to design electrostatic precipitators the formula y equals ABC is given. Taking into account the actual particle velocities calculated with the formula y equals ABC, it is demonstrated that the specific efficiency of the well developed flat plates (channel plates) reaches nearly the specific efficiency of double field screen pocket plates. The relationship between precipitator performance and power consumption is demonstrated.

39034 **APTIC NO. 62478**

Kubota, Torahide and Tsunehiro Yajima

VARIOUS RESULTS AND PROBLEMS OF STACK GAS DESULFURIZATION SYSTEMS. *(Haien datsuryu sochi no shokekka to shomondai). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(6):75-79, June 1974.*

Desulfurization efficiencies, dust collection efficiencies, treatment of liquid waste, desulfurization systems, and absorbent and adsorbent materials are the main topics of discussion. The Tokyo Metropolitan government has taken a policy in the past to emphasize control of high sulfur fuel. In addition to the continued efforts in this direction, future emphasis will be on the installation of stack gas desulfurization systems. By 1977, all boilers in Tokyo with more than 3000 l/day capacity must install desulfurization systems with more than 90% efficiency. The number of factories that will come under this regulation is 315, and account for more than 60% of the total fuel oil consumption in Tokyo. The effect of emission reduction is expected to be 39,000 tons/yr by 1977, which will constitute 49% of unregulated emissions from fixed emission sources (79,000 tons). As absorbents and adsorbents, caustic soda, ammonia, caustic soda and lime, lime, waste alkali, sodium sulfide, potassium sulfide, carbite, calcium carbonate, magnesium oxide, copper-alumina carrier, activated carbon, and manganese oxide are used, but 64% of the presently used adsorbent is caustic soda.

39035 **APTIC NO. 62476**

Kurosawa, Keiji

STACK GAS DESULFURIZATION COST AND THE PRICE OF FUEL OIL. *Haien datsuryu no kosuto to nenryoyu kakaku). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(6):24-31, June 1974.*

The comparison of fuel desulfurization and stack gas desulfurization from the standpoint of energy conservation, various cost analyses for stack gas desulfurizers, and the problem of white smoke for the wet type desulfurization system are discussed. The amount of fuel oil energy required for the desulfurization of stack gas is 4-5% of the total energy requirement, 5-6% for indirect fuel desulfurization, 8-10% for direct fuel desulfurization, and 12% for gasification of heavy oil. From the standpoint of energy economy, the wet stack gas desulfurization is the most economical; within the wet methods, the Wellman-Lord method uses 4.5%-5.4% of energy and the Chemico method uses 1.6% of energy. The presently operating major types of wet method stack gas desulfurization systems are: the Wellman-Lord method, the lime-gypsum method, the soda gypsum method, the thoroughbred method, and the sodium sulfate or mirabilite recovery method. The absorption processes, chemical reactions, absorbent recovery processes, by-product recovery processes, engineering construction processes, the locations of these processes, treatment gas quantities, and the dates of initial operations for these various types of systems are presented in a table. Costs of stack gas desulfurization vary depending on the process, scale, sale of by-products, and operation efficiency, but is is between $7.7-19.6/kl.

39036 **APTIC NO. 61771**

Lemezis, Sylvester, J. C. Agarwal, and George W. Land

AN ADVANCED COAL GASIFICATION SYSTEM FOR ELECTRIC POWER GENERATION. *Mining Congr. J., 60(4):22-27, April 1974. 1 ref.*

A multiple-fluidized bed gasifier concept is described for electric power generation via coal gasification, and a government-industrial development program for the process is outlined. The basic gasification process converts carbon and hydrogen from coal into a mixture of carbon monoxide and hydrogen. The complete system comprises three process units consisting of a dryer, a recirculating bed devolatilizer-desulfurizer, and a fluidized bed gasifier-combustor. Final gasification of low-sulfur char is conducted in a fluidized bed where char obtained from the devolatilizer-desulfurizer is burned with air at 2100 F to provide the gasification heat. Heat is transported from the combustor to the gasifier both by combustion gases flowing upward and by fines which escape upward and are caught and recycled back to the space between the combustor and gasifier. The process can accommodate a wide variation in fuel characteristics, including caking coals and high ash coals. Good heat economy is realized through the countercurrent movement of gases and solids between stages. Program steps are outlined for development of a gasification/combined cycle system.

39037 **APTIC NO. 62494**

Loffler, F. and W. Muhr

A STUDY OF THE DEPOSITION OF PARTICLES IN THE 1-10 MICRONS RANGE IN MODEL FILTERS. *Filtration Separation (Purley), 11(2): 172-178, March/April 1974. 12 refs. (Presented at the Filtration Society s Conference on What s New in Dust Control and Air Cleaning Exhibition, London, England, Sept. 25-27, 1973.)*

Theoretical calculations of the efficiency of fibrous filter always start with the consideration of an isolated or representative fiber. The filter is then represented by an arrangement of such fibers. In real fibrous filters not all the fibers have the same efficiency, due to their particular surroundings. The influence of the structure of the filter is largely unknown and it is very difficult to describe it. To get this influence under control and to test theories of fibrous filters, a model filter was constructed with equally spaced parallel polyamide fibers of 37.5 micron diameter. The porosity of this model filter is 92%. The measurements were done with monodisperse sodium chloride aerosols at filtration velocities between 25 cm/sec and 340 cm/sec. Bouncing off occurs even at low speeds (25 cm/sec) and with particles greater than 2.75 micron. At speeds greater than 75 cm/sec these bouncing effects are also important for the smaller particles. The results of the measurements can be explained only with an additional electrostatic effect. It has to be assumed that the particles and fibers are electrically charged, which means there is a coulomb interaction between particles and fibers. (Author abstract)

39038 **APTIC NO. 61836**

Machi, Sueo

REMOVAL OF NITROGEN OXIDES IN FLUE GAS BY IRRADIATION OF RADIOACTIVE RAYS. *(Haigasu-chu no chisso sankabutsu no hoshasen shosha ni yoru jokyo). Text in Japanese. Kinzoku (Metals) (Tokyo), 44(3):42-44, March 1974. 2 refs.*

A continuous flow irradiation apparatus was used to investigate the removal of nitrogen oxides from stack gases. Effects of the dose of radiation, temperature of the radiation, composition of the flue gases, and circulation flow rates were examined. If the flow rate of the flue gas was increased or the residence time of the flue gas in the irradiation chamber was reduced, a 2-second irradiation could remove 100% NOx and 90% sulfur oxides. Finely divided aerosols were formed which could be easily collected by electrostatic precipitators. The removal rate of NOx was increased by a power of 1 in proportion to the radiation dose, and the removal rage of SOx was increased proportionally to the power of 1.3.

39039 **APTIC NO. 62883**

Mackinger, H.

ODOR ELIMINATION BY CATALYTIC AFTERBURNING. *(Geruchsbeseitigung durch katalytische Nachverbrennung). Text in German. Umweltschutz Staedtereinig. (Vienna), 1974(5):117-118, 1974.*

In February of this year the first catalytic afterburning plant for odor elimination was put into operation in Austria in a bone processing plant. It has been designed for cleaning 5000 cu m/hr of waste air and vapors. With a catalyst type honeycat platinized ceramic, all odors are eliminated at a temperature of 350 C. The odorous air is drawn off from three layers and two flotation basins. In the heat exchanger this odorous air is preheated from 60 C to 205 C; in the following chamber with a natural gas-fired burner, the temperature is further raised to 350 C. At this temperature the waste air passes the catalyst. The plant operates for about 600 hours per month and consumes about 26 cu m natural gas/hr.

39040 **APTIC NO. 62668**

Magee, E. M., C. E. Jahnig, and H. Shaw

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION; SECTION 1: KOPPERS-TOTZEK PROCESS (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, ROAP 21ADD-23, Program Element 1AB013, Rept. EPA-650/2-74-009a, 52p., Jan. 1974. 25 refs.*

NTIS: PB 231675/AS

A report is presented on Koppers-Totzek coal gasification process. Topics reviewed include: processes description and effluents for coal preparation, the gasifier, gas cleaning, acid gas removal, the oxygen plant, the sulfur plant, utilities, gas compression, and auxiliary facilities; thermal efficiency; the fate of trace elements during combustion; possible process changes; and research and development needs. Potential process improvements include: higher pressure gasification, hydrolysis of carbonyl sulfide to hydrogen sulfide for complete sulfur removal, methanation to synthetic natural gas, the use of air or enriched air instead of pure oxygen for low Btu gas, and combining the process with a gas turbine for power generation.

39041 **APTIC NO. 62774**

Mann, David Edward

GAS FILTRATION. *(Dustraction Ltd., Leicestershire (England)) Brit. Pat. 1,345,977. 5p., Feb. 6, 1974. (Appl. July 8, 1971, 3 claims).*

A gas filtration apparatus for the removal of dust particularly from air in an industrial plant is described. The apparatus is particularly concerned with the cleaning of the filter bags in gas filtration apparatus during use to maintain the effectiveness of the filter. The cleaning is effected by a flow of gas in a reverse direction from the filtered gas side to the dust laden side through the filter bags to dislodge deposits. The gas is cleaned periodically at different times in relation to different filter bags or different groups of filter bags which in operation make up the complete filtration apparatus, thus part of the apparatus is always in use. Ordinary factor compressed air at from 80 to 120 psi can well be used as the primary gas. This induces secondary gas flow from the filtered gas zone and so produces a large volume of low velocity gas for cleaning the filter bags.

39042 **APTIC NO. 62556**

Marinelli, J. L. and R. L. Benefiel

DESIGNING FOR NOISE AND EMISSION CONTROL IN GENERAL AVIATION. *Can. Aeron. Space J., 20(3):85-92, March 1974. 5 refs. (Presented at the Canadian Aeronautics and Space Institute/Aircraft Industries Association of America Joint Meeting, Montreal, Canada, Oct. 30, 1973.)*

Required changes in general aviation design are reviewed in terms of new emission regulations for noise and emission of hydrocarbons, carbon monoxide, nitrogen oxides, and smoke. Initial work toward meeting the piston engine emission limitations will concentrate on adjustments to fuel-air mixture and ignition timing. Higher combustion temperatures at design conditions to reduce hydrocarbon and carbon monoxide emissions are expected to result in increased output of nitrogen oxides for piston and turbine engines. The emission regulations that apply to turboprop engines are relatively less severe than those applying to jets and can apparently be met using foreseeable extensions of current technology and methods. Compliance with the emission requirements for turbofan engines will apparently require the invention and development of new combustion systems to lower emissions to the level specified in the regulations. In general, compliance with the regulations will involve increased weight and drag and decreased power available.

39043 **APTIC NO. 62497**

Marks, Robert E.

ENVIRONMENTAL CONTROL AND ITS RELATION TO PULPING BY-PRODUCT RECOVERY PROCESSES. *TAPPI, 57(4):63-65, April 1974.*

With increasing provisions provided by law and public concern over the environmental impact of mill effluents and emission, process engineering evaluation and logical definition of problem areas are of increasing concern to mill management. In many cases, waste treatment may transfer one problem to another area with capital expense showing no economic return other than raising mill overhead and operating costs. Recent developments in combining environmental control with added by-product revenue have been beneficial in both air and effluent areas of the pulp mill. Reuse of hot process water which previously was a high COD (chemical oxygen demand) contaminated effluent stream has been effective in this area. Final disposal of residual fumes by incineration is practical and effective after final scrubbing. Proper relief profile from batch digesters can trim steam costs by 40.16/ton of pulp compared with conventional relief procedures. In excess of 90% recovery efficiency based on by-product sulfate turpentine availability in the chips can be expected with a coordinated system approach in a batch mill. There are basic process differences between batch pulping and continuous pulping that require broad examination of the processes, effects, and means of coping with each of the differences. (Author abstract)

39044 **APTIC NO. 61905**

Mihori, Suguru

CLEANING DEVICE FOR SOOTS AND DUST OF EXHAUST SMOKE. *(Haien baijin nado no joka sochi). Text in Japanese. (Assignee not given) Japan. Pat. Sho 49-11094. 2p., March 14, 1974. 1 ref. (Appl. April 4, 1969, 1 claim).*

A device to remove soot, dust, and harmful gases from waste gases is installed in the middle portion of a stack. Water is sprayed onto an evaporator plate and steam is produced which absorbs pollutants in the flue gas. A cooler plate then condensed the vapors which have adsorbed the pollutants and the water droplets fall to the waste liquor storage tank below.

39045 **APTIC NO. 61796**

Mitamura, Takashi, Kenji Kobayashi, Masaki Maruyama, and Minoru Kikuchi

THE EFFECTS OF METAL SALT COMPOUNDS ON LIME ABSORPTION OF SULFUR DIOXIDE. *(Sekkai no nisanka io kyushu ni oyobosu kinzoku enkabutsu no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 672, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G08.)*

The effects of calcium carbonate with a small amount of metal chlorides on the dry desulfurization process were examined. Commercial settling type and heavy calcium carbonate were mixed with 1 wt% of potassium chloride, sodium chloride, zinc chloride, copper chloride, and ferrous chloride respectively; 200 mg each of mixtures in alumina boats were heated at various temperatures between 800 and 1000 C for 0 to 6 min, and calcination and SO_2 absorption rates were checked. The SO_2 concentration was 15 vol% and the flow quantity was 8 ml/sec. Both settling and heavy $CaCO_3$ showed the effects of chlorides, but heavy $CaCO_3$ was affected slightly more. The effects of $ZnCl_2$ and $FeCl_3$ were drastic, and in 1.5 to 2 min, a 35 to 40% increase in calcination was noted. With SO_2 absorption, metal chlorides increased the $CaSO_4$ conversion rates in general, but the settling type $CaCO_3$ was especially affected. For instance, with a $ZnCl_2$ additive, the conversion rate at 800 C in 3 min stabilized at more than 90%.

39046 **APTIC NO. 62091**

Moore, D. O., Jr. and J. J. O Donnell

EVALUATION OF THE CONTROLLABILITY OF POWER PLANTS HAVING A SIGNIFICANT IMPACT ON AIR QUALITY STANDARDS. (FINAL REPORT). *Kellog (M. W.) Co., Houston, Tex., Engineering Research Div., Environmental Protection Agency Contract 68-02-1308, Task 1, Rept. EPA-450/3-74-002, MWKLG-RES-74-1283, RDO 4118-01, 164p., Feb. 1974.*

NTIS: PB 229706/AS

Results are presented from a study assessing costs and feasibility of applying limestone scrubbers to eight power plants located in Ohio. The plants were selected because of the impact of current sulfur dioxide emissions on air quality and the resultant need to reduce SO2 to levels consistent with state regulations. All eight coal-fired steam electric power plants can be retrofitted with a wet limestone scrubbing process for removal of SO2 and remaining particulate matter. Major factors influencing cost include: plant generating capacity, degree of installation difficulty, sulfur content of the coal, individual boiler size, flue gas flow rate per mw, and sludge disposal requirements. Estimated scrubber costs range from $30-85/kw for new plants and $35-100/kw for retrofit, considering plant sizes ranging from 250 mw to over 1500 mw.

39047 **APTIC NO. 62557**

Morton, H. L. and R. L. Marshall

IMPACT OF EMISSION REGULATIONS ON GAS TURBINE COMBUSTION DESIGN. *Can. Aeron. Space J., 20(3):101-109, March 1974. 7 refs. (Presented at the Canadian Aeronautics and Space Institute/Aircraft Industries Association of America Joint Meeting, Montreal, Canada, Oct. 29, 1973.)*

Standards for gas turbine aircraft engine emissions (carbon monoxide), unburned hydrocarbons, nitrogen oxides, and smoke) from engines manufactured after January 1979 are reviewed and compared with existing emission standards in an examination of design approaches that will be required to achieve the emission regulations. The comparison indicates that for engines with greater than 8000 lbs of thrust more than minor design changes will be required to comply with the 1979 regulations. The constraint of reducing emission levels is projected to result in gas turbine combustion designs which include some or possibly all of the following features: fuel staging or variable geometry, increased complexity in control systems, more than the conventional number of fuel sources, possible use of water injection, reduced levels of liner cooling in the burner front end, and premixing of fuel and air to obtain increased homogeneity of reaction zone equivalence ratio. The close control over fuel-air mixture honogeneity within the combustion will require closer monitoring and control of compressor exit/burner inlet conditions than might have been done in the past. (Author summary modified)

39048 **APTIC NO. 62592**

Mun, Fabek, Joen Che, Funsok Cha, and Lian Kim

STUDIES ON BLEACHING AND PURIFYING AMMONIUM NITRATE PLANT EMISSION GASES BY CATALYTIC DECOMPOSITION. *(Shokubaiteki bunkaiho ni yoru shoan kojo haigasu no mushoku mugaika ni kansuru kenkyu). Text in Japanese. Chosen Gakujutsu Tsuho (Korean Sci. Inf.), 11(1):102-105, 1974.*

Methods of industrial catalytic decomposition of nitrogen oxides using catalysts less expensive than platinum were investigated. Platinum, iron, and nickel catalysts were prepared and decomposition capacities were compared. Ammonia gas was mixed with NOx and with air separately, and after heating it to a given level, both gases were mixed and passed through catalytic layers. The NOx analysis was done by the Griess-Ilosvoy reagent and colorimetry, and ammonia analysis was done by sulfuric acid absorption and alkaline titration. The best sustained activity was obtained by an iron oxide catalyst. The activity was close to 100% at about 250 C. The decomposition rates and temperatures for various existing industrial catalysts are: Fe2O3, 87% at 225 C; nickel-chromium oxide, 34% at 225 C; zinc oxide and chromium oxide, 41% at 230; and vanadium oxide, 51% at 230 C. The refractory property of iron oxide was tested at 100 C and the NOx concentration was increased by 2%, but the catalytic activity remained at the same level. When the ratio of NH3:NOx is more than 1, the concentration of ammonia has no effect on FeO catalytic activity and the decomposition rate remains at about 99%. An experiment was conducted using about 10 l of catalyst tested intermittently for 60 days; catalytic activity was constant.

39049 **APTIC NO. 62586**

Muramoto, Nobuyuki

NOX REMOVAL AT NITRIC ACID PLANTS---NON-SELECTIVE CATALYTIC REDUCTION METHOD. *(Shosan puranto ni okeru NOx jokyo--- hisentakuteki sesshku kangenho). Text in Japanese. Preprint, Japan Management Assoc., p. 1-6, June 1974. (Presented at the Japan Management Association National Conference of Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 9.)*

The production scales of nitric acid in Japan are in the range of 100-450 tons/day, emitting exhaust gas of 14,500-65,000 N cu m/hr. The nitrogen oxides concentration in exhaust gas is 0.1-0.3 vol%. The exhaust gas from nitric acid plants contains a stable 2-3% oxygen, is free from other pollutants such as sulfur oxides, is maintained under high pressure, and thus presents suitable conditions for non-selective catalytic reduction, preferably using the platinum catalyst. The required preheating temperatures varied with the type of fuel were determined, which ranged from 10-30 C for hydrogen to 480-510 C for methane. The optimum ratio of fuel and O2 in exhaust gas was 1.1:1, which produced the removal rate higher than 90%. It is also essential to maintain the temperature at the outlet of catalyst layer above 600 C which can readily be attained. When using fuel requiring a high preheating temperature, a two-step catalytic system is more effective. Using the residual gas from ethylene plant as fuel (methane 65, ethane 20, H2 5-10 and butene 5-10 mol%), the one-step catalytic system is used successfully in 165 tons/day plant and the two-step system in 425 tons/day plants.

39050 **APTIC NO. 62583**

Nagata, Katsuya

THE EXTENT OF NOX REDUCTION BY COMBUSTION. *(Nensho ni yoru NOx was donoteido made sagerareduka). Text in Japanese. Preprint, Japan Management Assoc., p. 1-14, June 1974. (Presented at the Japan Management Association National Conference of Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 8.)*

Control measures for thermal nitrogen oxides formed by the reaction of nitrogen and oxygen in air are developed, based on the principle that the formation of NOx decreases with the reduction in oxygen concentration and retention time of combustible gas. The control measure for fuel NOx formed by the oxidation of a N2 compound contained in fuel is focussed on the reductionof conversion rate of the N2 compound to NOx by reducing the O2 concentration in the combustion chamber and the use of low N2 content fuels. The control measures in the area of combustion technology can be classified into thehree categories; operational conditions, combustion methods, and fuels. The operational condition includes the change in air ratio, alteration in mixing characteristics, decrease in thermal load, and decreased amount of air preheating. The combustion method includes the use of low NOx burner, two-step combustion, recirculation of exhaust gas, off-stoichiometric combustion, and water or steam spraying. The control measure by fuel indicates the use of low N2 content fuels. The validity of these approaches were examined in detail and evaluated.

39051 **APTIC NO. 61770**

Nakai, Yoshiyuki

BASIC TECHNOLOGY FOR AIR POLLUTION CONTROL. *(Taiki osen boshi e no kihon gijutsu). Text in Japanese. PPM (Japan), 5(1):32-38, Jan. 1974.*

No fundamental pollution control technology has been developed so far, even in industrially advanced countries. A pollution control program must be planned from the stage of raw material. Promising technology in desulfurization includes the wet catalytic method. The molecular sieve method can remove sulfur dioxide, nitrogen oxides, and mercury. Activated coal adsorption can be improved. One type of by-product recovery for stack smoke desulfurization makes ammonia sulfate solution from ammonia. A closed system for drying is described. The material to be dried is fed continuously into the drum from the hopper, and indirectly heated in the furnace. Steam and odorous gas are cooled and steam is separated as water. The odorous gas is completely thermally cracked as secondary air for the burner, becoming completely odorless water and carbonic acid gas. The equipment is capable of drying 1000 kg of raw material in 1 hr. This method will be the leading model for odor control after 1974 on.

39052 APTIC NO. 62142

Nakamoto, Mitsuyuki, Yoshioki Shingo, Mamoru Takeuchi, and Masaru Ogawa

CATALYST FOR ISPOSAL OF INTERNAL COMBUSTION ENGINE EXHAUST GAS, AND ITS MANUFACTURING METHOD. *(Nainenkikan haikigasu shoriyo shokubai oyobi sone seizo hoho). Text in Japanese. (The Fujikura Cable Works, Ltd., Tokyo (Japan)) Japan, Pat. Sho 49-11997. 4p., March 20, 1974. (Appl. Dec. 29, 1970, 2 claims).*

A fibrous metal consisting of copper or copper mixed with a small quantity of another metal having a surface layer of oxide is sandwiched between layers of a heat-resistant iron-base alloy containing nickel and/or chromium, and then bonded together by a heat treatment to produce the catalyst. Another way of manufacturing the catalyst is to place the mixture of copper oxide, metal halogenide, and carbonic substance on a web made of fine wires of the heat resistant iron-base nickel-chrome alloy. Another web of similar heat resistant material is then placed on the mixture after which it is heated at 750 C in a non-oxidating atmosphere until a fibrous metal composed of copper with a small quantity of another metal is deposited. This product is then cooled to room-temperature in the non-oxidating atmosphere and thereafter heat-treated in the presence of oxygen to produce the catalyst. The catalyst gives a 99.9% carbon monoxide removal efficiency in an automotive exhaust system.

39053 APTIC NO. 62775

Nilsson, Goran Alfred

AN APPARATUS FOR PURIFYING AIR OR OTHER GASEOUS MEDIA. *(Assignee not given.) Brit. Pat. 1,347,229. 6p., Feb. 20, 1974. (Appl. Aug. 23, 1972, 9 claims).*

An improved apparatus for cleaning or purifying air or other gaseous media from solid and/or fluid particles and/or gaseous substances or compounds is described. The apparatus consists of a preferably vertically disposed, substantially cylindrical rotatable centrifugal chamber, one end of which is closed and fixed to a driving shaft while the other open end is open and connected to an inlet duct serving for the introduction of polluted gas to be cleaned. There is a washing liquid inlet tube having at one end a preferably stationary injector for distributing the washing liquid within the centrifugal chamber whose circumferential wall is provided with outlet openings in the shape of fine nozzles or narrow slots diverging outwardly. The apparatus allows for a more uniform distribution of liquid and a better way to increase the capacity than the initial apparatus described in Brit. Pat. Serial No. 1,144,763.

39054 APTIC NO. 62485

Nishida, K. and T. Honda

ON THE DEODORIZATION WITH NEUTRALIZERS. *(Chuwazai ni yoru dasshu ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(2):97-104, 1974. 14 refs.*

Characteristics of the neutralization method for deodorization and examples of application of this method are described. The exhausted gas emitted from a dryer is water-cooled and washed using a jet collector (2400 rpm), goes through an atomizer neutralizer (for 2.5 sec) and is exhausted through a chimney of 15 m in height. The temperature of exhausted gas goes down from over 100 C to 40 C when it enters the atomizer. For cases of three factories, elimination of odorants are 88.8, 70.8 and 96.0% for ammonia, 61.8, 98.5 and 27.2% for hydrogen sulfide, and 66.8, 40.6 and 59.5% for ethyl mercaptan, respectively. The efficiency of the atomizer neutralizer is better when the temperature of exhausted gas is lower than 30 C in the atomizer. The reduction of odorants from excreta with neutralizer is examined by a chromatograph method. Contents of methyl amine, tri-methyl amine and propyl mercaptan are reduced by 70-80%.

39055 APTIC NO. 62432

Nordin-Fossum, Greta and Ants Teder

SCRUBBING OF HYDROGEN SULFIDE WITH HYDROGEN SULFITE SOLUTION. *Svensk Papperstid. (Stockholm), 77(6):211-217, April 10, 1974. 12 refs.*

Hydrogen sulfide in the stack gases from kraft mill recovery furnaces constitutes a noticeable air pollution. A method has been developed for the aborotion of hydrogen sulfide in an aqueous hydrogen sulfite solution. The effect of the liquor and gas composition, the type of contact, and other process conditions on the hydrogen sulfite absorption was studied on a laboratory scale. The highest absorption efficiency was obtained when solutions at low values of pH and a high concentration of hydrogen sulfite in the form of droplets were contacted with gas of relatively high velocity. The technical application of the method is discussed. (Author summary)

39056 APTIC NO. 61808

Noso, Shigeyuki

ON CENTRIFUGAL DUST COLLECTORS AND SCRUBBING DUST COLLECTORS. *(Enshinryoku shujin sochi senjo shujin sochi ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(4):51-55, April 1974.*

Criteria for the selection of an appropriate dust collector are discussed. A centrifugal dust collector is suitable for removal of large dust particles which exist in a comparatively high concentration. The particle size distribution is mostly of 10 microns or greater. This type of dust collector is most effectively used as a pre-duster. A scrubber can be used effectively for removal of dust with a particle size of 1 micron or greater if the gas and the dust contained therein can be put in contact with water without danger and if there is a sufficient water supply for the scrubbing. The scrubber type dust collector also removes harmful gases by absorption at the same time. The information a manufacturer of dust collectors needs from the prospective user is stated item by item. It includes the purpose, the process systems placed before and after the dust collector, a detailed description of particular processes where dust is generated, the type and properties of the gas to be treated, the desired dust removal efficiency, the allowable pressure loss, the disposal method of the dust collected, the planned flue or stack design and overall layout, and the installation space. Items which also must be considered are the quantity, temperature, pressure, and composition of gas; particle size distribution; the true specific gravity of the dust particle, dust concentration at the entrance, and the measurement method. General maintenance procedures are also listed.

39057 APTIC NO. 62513

Obana, Teruji

AFTERBURNER CONTROL AND SAFETY EQUIPMENT. *(Afutabana no seigyo kiki ni tsuite). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(14):35-38, March 1974. 1 ref.*

The safety standard for afterburners is not clearly established in Japan. The safety standards set by four independent agencies in the USA are reviewed. The required items are the purge timer with interlock for the complete pre-purging of combustible gas; a flame detector such as a flame rod or infrared, ultraviolet, or visible light detectors; various automatic safety valves; and a temperature control for efficient combustion and fuel consumption. A vapor concentration indicator connected to the control valves and alarm system is essential to maintain the vapor concentration below the explosion level. The burner control for regulating the flow rate of fuel is used for the temperature control of combustion chamber. A schematic diagram of reliable and low cost temperature control system is given. The pollutant concentration of exhaust gas at the inlet and outlet of afterburner has to be measured and checked against the environmental standard.

39058 **APTIC NO. 61842**

Oka, Takeshi

AN EVALUATION OF AIR INJECTION IN REDUCING EXHAUST EMISSIONS. *(Haiki no bunseki nomi ni yoru niji kyoku kuki koka no ichi-hanteiho). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 13(3):27-32, March 1974. 3 refs.*

A simple calculation method for the evaluation of secondary air as a control method for engine exhausts is presented. The exhaust gas is analyzed before and after air injection, the mathematical formula is applied, and reductions in the pollutant concentrations of the exhaust gas can be compared.

39059 **APTIC NO. 62350**

Okada, Hiroshi

DENITRIZATION METHOD USING AMMONIA GAS. *(Anmonia gasu ni yoru NOx jokyo taisaku). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(4):313-320, April 1974.*

Solutions to the problem involved in the gas-phase reaction process of nitrogen dioxide with ammonia gas are studied. An experiment designed to study the reaction velocity, effect of excess ammonia rate, removal of fumes, washing of active carbon, and drying of the washed active carbon was performed. The NO2 removal efficiency is higher with a higher mole ratio of ammonia but reaches equilibrium at about 80% when the NO2 concentration at the entrance is 100 ppm, and at 95% or higher when it is 1000 ppm. No effect of water content on the reaction was observed in the relative humidity range of 40-90%. Based on this finding, the mole ratio of ammonia can be easily determined according to NOx concentrations at the entrance and exit of a denitrization system using ammonia gas. Fumes of ammonium nitrate or ammonium nitrite cause a visual problem. The conventional fume removal devices include scrubbers and supersonic aggregation devices which are unsatisfactory, and the use of an adsorbent for removal of the fume was therefore studied. Of active carbon, molecular sieves, and silica gel experimentally used for this purpose, the active carbon gave the best results. To regenerate the used active carbon, the carbon was washed with water and then dried. Effective washing and drying methods are described. The gas-phase reaction process with ammonia in which the fume produced by the reaction is removed by regenerable active carbon is a highly effective denitrization method.

39060 **APTIC NO. 61751**

Ono, Chotaro

DUST ELIMINATION AND COLLECTION TECHNIQUES. *(Jojin shujin gijutsu). Text in Japanese. PPM (Japan), 5(5):94-130, May 1974.*

Dust elimination and collection techniques and equipment are comprehensively reviewed. The topics include: particle sizes and distribution, dust collector types and their principles and mechanism, soot emission sources and their functions, amount of soot formation and calculation, and the selection of control equipment, maintenance, and management. The collectors discussed are: mechanical dust collectors, scrubbers, filter bags, electrostatic precipitators; emission sources are boilers, stoker combustion boilers, sintering furnaces, open furnaces, oxygen furnaces, electric furnaces, cupolas, non-ferrous metal refineries, cement producers, and frame material dryers. The selection of dust collection equipment is determined by the source environment conditions, meteorological factors, and the collection rate. The types of soot and smoke, concentration and quantity can affect the performance of equipment; therefore, the emission gas must be studied thoroughly before selecting the collection equipment. Settling chambers and centrifugal collectors tend to have higher collection rates when the pollution concentration at the entrance is high; but this means also high concentration at the exit. These are not ideal as singly-used control equipment. Venturi and jet scrubbers tend to clog at the throat section and nozzles; therefore, the treatment gas should be less than 10 g/N cu m. Sound wave collector is suitable for gas concentration of 1-5 g/N cu m, and when the dust concentration is lower, a coagulation agent should be used. Filter collectors are suitable for low concentration gas; when the dust concentration is high, a continuous dust shaker should be used. Electrostatic precipitators are suitable for dust concentration of about 30 g/N cu m.

39061 **APTIC NO. 62279**

Ovard, J. C. and J. I. Reisman

COOLING TOWER FOG PLUMES CHARACTERISTICS AND CONTROL. *Ecodyne Corp., Santa Rosa, Calif., Ecodyne Cooling Products Div., 24p., 1974 (?). 10 refs.*

The fog potential for mechanical draft cooling towers is discussed with specific emphasis on methods of controlling mechanical draft cooling tower fog plumes. The formation and characteristics of cooling tower fog, and the mechanical draft cooling tower fog plume behavior are outlined. Evaluation of natural meteorological phenomena suggests that the critical time period for the formation of extensive cooling tower induced ground level fog and the potential for visibility or icing problems occurs between 3 and 7 am, during fall or winter months. It is during this time that temperatures are the lowest and relative humidity is high, coupled with stable atmospheric conditions. When cooling tower fogging does occur, it is usually observed for 1-4 hr, after which natural changes in temperature and atmospheric stability cause it to recede. Rarely does it persist for more than 6 hr. An analysis of operation variations and their effect on visible plume lengths shows that a reduction in the heat load on the tower will substantially reduce the visible plume length. This can be done by heating the cooling tower exhaust air without adding moisture. An air-cooled head exchanger can be installed at the fan stack discharge or stack gas burners can be used. The most effective way is the wet/dry tower and the Ecodyne Foglimitor System is described.

39062 **APTIC NO. 62537**

Peters, Bruce and Gary Borman

LOW NITRIC OXIDE EMISSIONS VIA UNSTEADY COMBUSTION. *Combustion Flame, 22(2):259-261, April 1974. 4 refs.*

A cyclically operated burner capable of yielding essentially constant exhaust temperatures concomitantly with low exhaust emissions is described. The basic concept of postflame heat extraction for nitrogen oxide reduction is used with a novel cyclic operating mode. The components of the system include a fuel flow control system, a flame holder, assumed to be a porous metal disk, a heat sink (regenerator), and a tube to contain the flow as well as support the porous disk and the heat sink. Some feasibility experiments were carried out on a steady-state porous disk burner modified for cyclic operation. Nitric oxide concentrations were low, nitrogen dioxide concentrations were negligible, hydrocarbons were high at the top probe but below 10 ppm hexane downstream from the heat sink, and carbon monoxide levels were essentially the equilibrium values for combustion products. The burner is applicable to a wide range of operating conditions and can accommodate high mass flow rates and thus high energy fluxes. With the exception of heat lost to the surroundings and radiation heat transfer from the heat sink to the flame holder, there is no wasted energy. Thus, burner efficiencies can be high although the available energy is decreased. The burner is also a simple piece of apparatus.

39063 **APTIC NO. 62264**

Pigott, P. G., E. G. Valdez, and K. C. Dean

STEAM-CURED BRICKS FROM INDUSTRIAL MINERAL WASTES. *Bureau of Mines, Salt Lake City, Utah, Salt Lake City Metallurgy Research Center, Rept. RI 7856, 16p., 1974. 8 refs.*

The production of steam cured bricks from industrial mineral wastes as a means of controlling air and water pollution is described. Wastes, utilized to produce bricks, consist of copper mill tailings, roofing granule fines, asbestos fines, and zinc mill tailings. Bonding of the wastes with either calcium hydroxide or portland cement results in building bricks that meet American Society of Testing and Materials (ASTM) specification C73-67 for grade SW and MW bricks when evaluated in accordance with ASTM designation C67-66 on sampling and testing of brick. Utilization of the [illegible] wastes could eliminate the need for excavating [illegible] for brick material production and thus prevent [illegible] of the countryside and simultaneously avoid the [illegible] of fine dust, a potential air pollutant. An economic evaluation of the process indicates the total operating cost per 1000 bricks is about $36. (Author abstract modified)

39064 **APTIC NO. 62850**

Pijpers, Franciscus Wilhelmus and Nicolaas van Lookeren Campagne

REGENERATING SULFUR DIOXIDE SOLID ABSORBENT. *(Verfahren zum Regenerieren eines mit Schwefeldioxid beladenen festen kohlenstoffhaltigen Adsorptionsmittels). Text in German. (Bergwerksverband GmbH, Essen (West Germany)) W. Ger. Pat. 1,467,154. 4p., Jan. 3, 1974. 5 refs. (July 1, 1964, 2 claims).*

A method for the regeneration of solid carbon-containing absorbents such as granulated activated carbon, as used for the adsorption of sulfur dioxide from flue gases, is described. Regeneration is done by heat and simultaneously by a hydrocarbon, such as methane, or a hydrocarbon-containing gaseous mixture that is passed through the system. Water vapor is added preferably to the reducing gas used for regeneration and for SO2 desorption. The adsorption system does not require the initial gases to be cooled as in a wet adsorption method. During desorption, the sulfur trioxide formed in the course of adsorption on the activated carbon, is reduced.

39065 **APTIC NO. 62692**

Plungis, Donald

A STUDY OF FUEL ECONOMY CHANGES RESULTING FROM TAMPERING WITH EMISSION CONTROLS. *Environmental Protection Agency, Washington, D. C., Office of Mobile Source Air Pollution Control, Rept. 74-21-DWP, 29p., Jan. 1974.*

A test program was undertaken to quantify the fuel economy and emission change which would result from disconnecting emission controls on vehicles and to determine whether private service garages could effectively improve fuel economy. A number of garages were contacted with the request that they do whatever they could to improve gasoline mileage on 10 late model cars. Average passenger vehicle fuel economy improvements of approximately 10% were obtained by tampering on 1973 and 1974 cars equipped with the most stringent emission controls. Emissions of air pollutants (hydrocarbons, carbon monoxide, and nitrogen dioxide) increased an average of approximately 65.9%, 20.9%, and 125.7% respectively, through such readjustment. Independent garages in most cases (70%) performed modification in which fuel economy losses result. The average change in fuel economy for 13 cases of garage tampering was a reduction of -3.5%. Only four cases out of 13 achieved even minor improved fuel economy. It appears that widespread independent garage emission control system tampering would be expected to increase fuel consumption at significant cost in terms of increased air pollution.

39066 **APTIC NO. 62362**

Pohl, Kurt M.

EMISSION OF HYDROCARBONS FROM STORAGE TANKS - ORDER OF MAGNITUDE, THERMAL PROCESS STEPS FOR THE REDUCTION OF THEIR LOAD ON THE ATMOSPHERE. *(Die Belastung der Umwelt durch von Lagertanks verursachte Kohlenwasserstoffemissionen). Text in German. Erdoel Kohle - Erdgas - Petrochemie, 27(5):267-272, May 1972. 2 refs.*

Two different condensation processes for the purification of gasoline storage and transport tank vent streams are compared with each other on the basis of a simplified gasoline analysis. One is a simple condensation process whereby the air/vapor mixture is cooled and the other is the same with the addition of simultaneous application of falling film. Qualitative comparisons with other applicable unit operations/processes (absorption, adsorption, and incineration) are carride out. A condensation in the presence of a falling film layer consisting of stored gasoline appears to be effective and economical. Costs for a plant with a capacity of 1000 cu m/hr containing 0.6 kg gasoline/l amount to about $250,000. The total cost per liter of recovered gasoline is 5 cents.

39067 **APTIC NO. 62150**

Preszler Laszlo and Tamas Lajos

ADDITIONAL REMARKS TO UNIFORMITY OF VELOCITY DISTRIBUTION AT THE ENTRY OF FLOWING GAS INTO AN ELECTROSTATIC PRECIPITATOR. *(Zusatzbemerkungen zur Gleichmaessigkeit der Geschwindigkeitsverteilung beim Eintritt eines stroemenden Gases in ein Elektrofilter). Text in German. Staub, Reinhaltung Luft, 34(5):181-182, May 1974. 2 refs.*

An earlier publication is completed by the dimensionless form of the Navier-Stokes equation. This dimensionless equation system yields the same results for the model and the full-scale version if the following conditions are fulfilled. The Foude number and the Reynolds number must be the same in the model and the full-scale version, the entrance and exit velocities at the electrostatic precipitator model and the full-scale version must be equal, and geometric similarity must exist between model and full scale version.

39068 **APTIC NO. 62539**

Putnam, A. A.

EFFECT OF RECIRCULATED PRODUCTS ON BURNING VELOCITY AND CRITICAL VELOCITY GRADIENT. *Combustion Flame, 22(2):277-279, April 1974. 7 refs.*

As part of an effort to evaluate the effects of reducing nitrogen oxide emissions by the use of recirculated products of combustion, the change in burning velocity and in flame stability resulting from the addition of products of combustion to a combustible mixture was estimated. A correlation of data obtained in developing a satisfactory predictive method appears to be of basic and applied interest. Attention was focused on burning velocity data and flashback velocity gradient data of stoichiometric mixtures of methane, hydrogen, and propane and air. The sets of data were correlated, and a simple argument based on Brokaw-Gernstein treatment of the SZFK equation was then used to arrive at the predictive equation. Another predictive equation was developed with terms evaluated relative to the flame temperature rather than to the ambient temperature in the first equation. The two types of data were then compared directly by plotting results. This plot for reduced burning velocity and critical velocity gradient as a function of temperature depression resulting from heat loss gave almost a straight line.

39069 **APTIC NO. 62433**

Quane, D. E.

REDUCING AIR POLLUTION AT PHARMACEUTICAL PLANTS. *Chem. Eng. Progr., 70(5):51-56, May 1974. 10 refs.*

Control of odor and particulate emissions from fermentors, waste water treatment, and coal-burning boilers at pharmaceutical plants is reviewed. The following control methods are evaluated: incineration of odors from fermentation units and from waste water treatment in the existing boilers; elimination of cinder reinjection to reduce particulates from coal combustion; ozonation of certain fermentation exhaust gases; incineration of waste treatment sludges in boilers; and use of centrifuge to concentrate the sludge. Incineration and ozonation of odors were effective and economical solutions to odor control in a large fermentation complex. Odor control of waste water odors was achieved by enclosing the plant and incinerating the sweep gases in boilers. Potential odors associated with the handling and disposal of waste treatment sludge were eliminated by incineration of sludges in boilers; a centrifuge was used successfully to concentrate the sludge, resulting in improved economics. A technique for significantly reducing particulates from coal-fired boilers by eliminating cinder reinjection was developed. This novel solution was preferable to converting to oil, where there is a severe question as to the reliability of the fuel supply, or to the installation of electrostatic precipitators, where there is a question of the effectiveness with low sulfur coal. A new instrument which reduces the time for measurement of particulate emission from stacks was also evaluated. This worked on the principle that the friction resulting from smoke particles sweeping across a sensing head generates a voltage which can be drained and measured. (Author conclusions modified)

39070 **APTIC NO. 62399**

Quig, Robert H.

RECYCLING SO2 FROM STACK GAS: TECHNOLOGY ECONOMICS CHALLENGE. *Prof. Engr., 44(5):22-24, May 1974.*

Sulfur dioxide recovery from stack gas can be best achieved with the use of magnesium oxide as an additive in a properly designed scrubbing system. This gives 90% or better SO2 removal, is a closed-loop recycle-regeneration system, divorces on-site SO2 removal operations from off-site SO2 recovery operations, and has SO2 recovery operations at one centralized facility. Several prototype operations are described. The cost of this process appears to be $35-60/KW, depending on scope. The higher rate tends to be for two-stage systems on coal-fired boilers including fly ash removal and draft fans. Economics and costs for the MgO scrubbing system in an oil-fired boiler, a sulfuric acid process plant, and a power plant are described.

39071 **APTIC NO. 62364**

Riethmann, H.

BURNER SYSTEMS FOR HIGH EFFICIENCY FURNACES. *(Brennersysteme fuer Hochleistungsfeuerungen). Text in German. Oel Gasfeuerung, 19(3):152-166, 1974.*

Methods, are discussed for achievement of a complete combustion in fuel oil-fired furnaces with return of the excess air so that near stoichiometric conditions are reached is feasible without impairment of the degree of efficiency, but the danger of an inadmissibly high soot production rises. The products of incomplete combustion are very fine-grained soot and fly coke. The emission of unburned or partially burned components of the fuel oil is due to unsatisfactory mixing of fuel with air, to an inadequate residence time at high enough ignition temperature, and to lack of air. Through too high oxygen surplus it is possible that large quantities of sulfur dioxide are converted to sulfur trioxide. Also more nitrogen dioxide may be formed. An alternative for the prevention of soot and fly dust development through high air surplus is the recirculation of hot combustion products from the flame end to the root of the flame. Fuel and combustion air must be entered with sufficiently high impulse. A recirculation can be achieved witha radial blower and through installation of a tube in which the flow of the fuel/air mixture is too high to permit ignition. Also, intense mixing through installation of barriers will prevent soot formation. Through division of the combustion air into two flows combustion can be intensified and a more complete combustion can be achieved.

39072 **APTIC NO. 61713**

Rosson, Joseph L.

CORNELL'S ELECTRIC CAR. THE DEVELOPMENT OF AN URBAN VEHICLE WITH NO EMISSIONS. *Eng.: Cornell Q., 8(4):31-38, Winter 1974.*

The Cornell Electric Car Project is described. Three electric vehicles have been designed and tested. Specifications and performance characteristics of the cars are described. The design of propulsion controls, the main battery, solid-state devices for control systems, the separately excited D.C. motor, and the educational value of the project are described. The car produces no harmful emissions.

39073 **APTIC NO. 62587**

Sakurada, Toshio

NOX CONTROL MEASURES FOR STEEL INDUSTRIES. *(Tekko no NOx taisaku ni tsuite). Text in Japanese. Preprint, Japan Management Assoc., p. 7-17, June 1974. (Presented at the Japan Management Association National Conference of Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 9.)*

Two committees, one established September 1972 and the other in August 1973, are engaged in the development of nitrogen oxides control measures for steel industries. The guiding principles, present status of NOx control measures, organization chart, operational procedures, and control programs for 1973, 1974, and 1975 are described. The environmental standard for nitrogen dioxide was established in May 1973, followed by the emission standard for NOx in August 1973. Reports by the committee on NOx emission status and control measures are described. The NOx concentration varies greatly depending on the type of furnace, fuel and operational conditions, however, the examples of maximum values are sintering furnace 280 ppm, blast furnace 160 ppm, scaling furnace 230 ppm, coke oven 250 ppm, and generator boiler 240 ppm. The NOx emission from a sintering furnace varies with the nitrogen content in coke; however, the reduction in N content in coke is technically difficult at present and the control by changing the operational condition it also almost impossible. The emission from blasting furnace varies with dome temperature, oxygen content in exhaust gas, and calorific value of fuel, and further improvement in this area is inconceivable. The emission from a scaling furnace which varies with fuel, O2 content in exhaust gas, and exhaust gas temperatures can be reduced by increasing the gas mixed firing ratio, low O2 combustion, lowering exhaust gas temperature, and use of low NOx burner. The emissions from a generator boiler is governed by the factors similar to those of scaling furnace, and the control measures include two-stage combustion, recirculation of exhaust gas, and improvement in burner structure as well as those for the scaling furnace.

39074 **APTIC NO. 62390**

Schluep, H.

DUST COLLECTION PLANT FOR THE ELECTRO STEEL PLANT OF THE VON ROLL AG, GERLAFINGEN. *(Entstaubungsanlage fuer das Elektrostahlwerk der von Roll AG, Gerlafingen). Text in German. Gesundheitstech., no.4:84-86, 1974.*

The electric arc furnaces of the von Roll steel plant have been equipped with a cloth fiber for dust collection. All waste gas from the furnace (about 75,000 cu m/hr) is drawn off and passed through a water-cooled pipe system at a speed of 25 to 30 m/sec and a temperature of 400-500 C to a cooler. The gas is cooled to the filter entrance temperature of 120 C. Each of the filter casings of the two dust collectors are divided into 18 chambers with each chamber holding 18 filter bags of polyacrylonitrile. The total filter area is 745 sq m and is so large that the gas velocity is only 1.5 cm/sec which guarantees a thorough cleaning of the gas. The 10 g/cu m dust concentration in the uncleaned gas is reduced to 50 mg which corresponds to a collection efficiency of 99.5%. For cleaning, one chamber after the other is taken out of operation and cleaned by rapping and by a countercurrent air jet. The dust collection system has been in operation since mid-March of 1973.

39075 **APTIC NO. 62761**

Shah, Indravadan Shantilal

REMOVAL OF SULPHUR DIOXIDE FROM GAS STREAMS. *(Chemical Construction Corp., New York) Brit. Pat. 1,346,838. 6p., Feb. 13, 1974. (Appl. Oct. 27, 1971, 8 claims).*

A process for the removal of sulfur dioxide from a gas stream by scrubbing with a circulating aqueous magnesium sulfite-bisulfite solution is described. The use of the sulfite-bisulfite solutions or slurries is known, but this process is commercially applicable and uses an annular venturi. Generally, highly efficient scrubbing and removal of most of the SO2 from the gas stream is attained with relatively low liquid to gas flow ratios, owing to the provision of central axial dispersion of a portion of the scrubbing liquid into the venturi passage or contactor. This is an efficient and economical method of controlling air pollution.

39076 **APTIC NO. 62393**

Shaikhutdinov, A. M., V. M. Rusak, V. M. Klevanskii, I. S. Saburov, and L. F. Shaikinurova

AFTERBURNING OF HIGH-TEMPERATURE PRODUCTS OF INCOMPLETE COMBUSTION IN A SUPERSONIC STREAM WITH SECONDARY INJECTION OF THE OXIDIZER. *Int. Chem. Eng., 14(2):270-274, April 1974. 2 refs. (Also: Inzhenerno-Fiz. Zh. 25(2):197-203, Aug. 1973.)*

The results of an experimental investigation of the afterburning of a supersonic stream of incomplete combustion products at the expense of secondarily injected oxidizers -- nitric acid and nitrogen tetraoxide -- are examined. The static pressure variation was measured along the length of the reaction zone to determine the rate and completeness of the afterburning of the high- temperature (3000-3200 K) supersonic stream containing hydrogen and carbon monoxide. The experimental apparatus and chemical reactions in the system are described. (Author abstract modified)

39077 **APTIC NO. 61792**

Shirasawa, Tadao

PRE-MEASUREMENT OF DUST CONCENTRATION. *(Jizen sokutei no yarikata). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(2):43-48, Feb. 1974.*

Prior to the selection of type of dust collector it is necessary to know the amount, concentration, and properties of the dust exhausted from the installation. In JIS B 9909 a number of points are enumerated as checks for the maintanece of dust collectors. First are the amount, temperature, pressure, and physical/chemical properties of the gases treated. For these, checking of temperature, composition (especially existence of sulfur trioxide), and flow rate are important. Next is the properties of the dust grain, for which size distribution and electrical resistivity are indispensable. Finally, dust concentration and possible sources of noise and vibration in the exhaust gas should be checked. Analysis of poisonous metals in the dust, like cadmium or lead, is also necessary. Methods for measurements of these items are described in JIS Z 8808. To measure dust concentration in the duct continuously, modified continuous filter tape samplers can be used. For measurements in installations which have no ducts attachment of temporary ducts is recommended. The following points from JIS Z 8808 must be modified: the measurement method when amounts of gas and dust are fluctuating, the measurement method for furnaces without ducts, precise measurements of low flow rates, uniform suction of gas, and selection of dust sampler.

39078 **APTIC NO. 62659**

Shoup, R. D., K. E. Hoekstra, and R. J. Farrauto

THERMAL STABILITY OF A COPPER-CHROMITE AUTO EXHAUST CATALYST. *Preprint, American Ceramic Society, Columbus, Ohio, 29p., 1974. 6 refs. (Presented at the American Ceramic Society, Annual Meeting, Chicago, Ill., April 29-May 2, 1974.)*

The thermal stability of a copper chromite auto exhaust catalyst and its application in air pollution control are discussed. Catalytic devices are being used to meet the Federal regulations of the Clean Air Act of 1970 regarding noxious emissions. Copper-chromia containing catalysts are possibilities for auto exhaust purification. They convert carbon monoxide and hydrocarbons to harmless carbon dioxide and water. With the expectant removal of lead from the gasolines and minimization of sulfur oxide poisoning by operating the exhaust at a high temperature, the problem of thermal stability of the catalyst has to be considered in temperature ranges up to 1475 F. The unsupported catalyst was first studied and degradation mechanisms isolated. From these studies a stable catalytic and chemical system was obtained.

39079 **APTIC NO. 62395**

Small, W. J., D. E. Fetterman, and T. F. Bonner, Jr.

ALTERNATE FUELS FOR TRANSPORTATION. PART 1: HYDROGEN FOR AIRCRAFT. *Mech. Eng., 96(5):18-24, May 1974. 21 refs.*

The cost of conventional aircraft transportation is projected to rise due to increasing petroleum prices and the indirect, but nonetheless real, cost of reducing noise and air pollution. Liquid hydrogen has great potential as an aviation fuel because of its high energy content and cooling capacity, its minimal environmental impact, and its potentially unlimited supply. Its use as a fuel will greatly improve the performance of subsonic and supersonic aircraft. Hydrogen fuel could make possible hypersonic transports capable of carrying travelers to any portion of the globe within a few hours. At some time within this century, hydrogen fuel is expected to become relatively cheaper for air transportation than conventional fuel. Given the long lead times necessary for new aircraft development, the use of hydrogen should merit immediate increased attention by government and industry to provide a sound technological base form which the aircraft industry can draw. (Author conclusions modified)

39080 **APTIC NO. 62452**

Sorenson, S. C., J. A. Wronkiewicz, L. B. Sis, and G. P. Wirtz

PROPERTIES OF LACOO3 AS A CATALYST IN ENGINE EXHAUST GASES. *Ceram. Bull., 53(5):446-449, 1974. 14 refs. (Presented at the American Ceramic Society, Annual Meeting, 75th, Joint Session III, Cincinnati, Ohio, May 1, 1973, Paper 4-JIII-73.)*

Lanthanum-cobalt oxide was proposed as a potential automotive exhaust catalyst on the basis of activity measurements using laboratory gas mixtures. In the present work catalytic conversions of carbon monoxide, hydrocarbon, and nitric oxide by LaCoO3 were measured in the exhaust stream of a single cylinder research engine burning lead-free fuel. Emphasis was placed on the chemical changes occurring in LaCoO3 as a result of exposure to the engine exhaust atmosphere and its effect on catalytic activity. The catalytic activity of LaCoO3 for NO reduction was the result of the formation of a nonstoichiometric structure having the chemical formula LaCo1-xO3-y, where 0.0 is less than x is less than or equal to 0.08 and 0.0 is less than y is less than or equal to 0.5. This observation has additional significance in relation to chemical and structural stability of the catalyst in the exhaust gas environment. (Author abstract)

39081 **APTIC NO. 62429**

Stinnett, S. James, Douglas P. Harrison, and Ralph W. Pike

FUEL GASIFICATION. PREDICTION OF SULFUR SPECIES DISTRIBUTION BY FREE ENERGY MINIMIZATION. *Environ. Sci. Technol., 8(5):441-444, May 1974. 6 refs.*

The principle of thermodynamic free energy minimization has been applied to fossil fuel gasification processes to predict the effect of operating variables on the composition of the equilibrium product gas. Particular attention has been paid to sulfur-containing species so that the requirements of potential desulfurization processes can be better defined. At conditions representative of current gasification technology, hydrogen sulfide, as expected, is the predominant sulfur species. Small, but significant amounts of carbonyl sulfide are also present at these conditions. Extension to gasification conditions likely to be encountered as technology progresses shows decreasing hydrogen sulfide concentration with carbonyl sulfide and/or diatomic sulfur concentrations increasing. (Author abstract)

39082 **APTIC NO. 62886**

Stuffken, Jan and Frans J. Wetzels

UNDERGROUND GASIFICATION OF HARD COAL. *(Die Untertagevergasung von Steinkohle). Text in German. Glueckauf (Essen), 110(12): 485-488, June 20, 1974. 10 refs.*

The underground gasification of hard coal is technically feasible. The price of the product gas is largely dictated by the local conditions. At the present European conditions the price would exceed the present natural gas price by more than a hundred-fold. The gas obtained from coal gasification contains sulfur compounds which stem from the coal. Additional installations for retention of the gaseous sulfur compounds would be necessary for reasons of environmental protection. There is also a danger that gases may escape into the atmosphere. Underground coal gasification therefore is not a competitive process at this moment for this and other reasons such as groundwater pollution, too much heat loss to the neighboring rock formations, and the uncontrollable character of the underground process.

39083 **APTIC NO. 62435**

Takagi, Toshimi, Kenich Fujii, and Mitsunobu Ogasawara

EVALUATION OF VARIOUS FACTORS AFFECTING NITRIC OXIDE FORMATION AND EFFECTIVENESS OF SOME EMISSION-CONTROL SYSTEMS. *Fuel, 53(2): 114-119, April 1974. 8 refs.*

Effects of fundamental factors, such as temperature, pressure, equivalence ratio and fuel type, which affect nitric oxide formation are evaluated. Some emission-control systems are modelled analytically and their effectiveness for nitric oxide emission control is evaluated by chemical kinetics. By raising the temperature, the rate of nitric oxide formation is increased remarkably, and by lowering the temperature below about 1700 K it may be almost prevented. At the same temperature, rates of formation are larger for leaner fuel/air mixtures, and higher pressure results in a somewhat lower equilibrium concentration but a higher rate of formation. Nitric oxide formation is little affected by the type of hydrocarbon fuel if the temperature and the equivalence ratio are the same, but it differs for each fuel at the adiabatic flame temperature of each. At the adiabatic flame temperature, the equilibrium concentration reaches its maximum at around phi equals 0.85, but the rate of formation is highest at around phi equals 1.0 for propane/air flames. Reduction of nitric oxide by means of exhaust gas recirculation and water injection systems is attributable to the resulting lowering of temperature. A two-stage combustion system becomes more effective when the temperature drop or heat loss in the primary combustion region increases. (Author abstract)

39084 **APTIC NO. 59797**

Takashima, Akio, Yoshinobu Hasegawa, and Takeshi Sakano

NOX REMOVAL OF MON PROCESS. *(Shisshikiho ni yoru chissosankabutsu no jokyo gijutsu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(1):77-84, Jan. 1974. 4 refs.*

Oxides of nitrogen include nitrous oxide, nitric oxide, nitrous anhydride, nitrogen dioxide, and nitric anhydride. Their properties are tabulated. Toxicity of NOx, especially NO and NO2, is briefly discussed, with reference to the effects of NO2 on human health. Stationary sources of NOx emission are classified into three categories including power generation, heating, and chemical processing. The first category consists of boilers and internal combustion engines. Metal heat-processing furnaces, petroleum and petrochemical furnaces, and cement kilns belong to the second category. The third includes surface treatment processes, melting processes, and nitric acid treatment. Types of denitrization processes are discussed with special attention to the wet processes. The MON denitrization process is described. Designed for stack gas denitrization, the MON process is a wet type process using an absorbent of potassium permanganate and alkali. It features high NOx removal efficiency and can reduce NOx concentration of the gas to below 100 ppm regardless of the original NOx concentration and NO/NOx ratio or whether there is any other gas present.

39085 **APTIC NO. 61907**

Tawa, Kyosuke

RECENT ENVIRONMENTAL PROBLEMS AND TOWN GAS ENTERPRISE. *(Saikin no kankyo mondai to toshigasu jigyo). Text in Japanese. Nihon Kikai Gakkai-shi (J. Japan. Soc. Mech. Engrs.), 77(663):206-211, Feb. 1974. 15 refs.*

The town gas industry has a responsibility to furnish a stable and nonpolluting supply of energy. Over the last 10 years energy consumption per person per year has incereased from 0.78 million kcal to 1.95 million kcal. This tendency may continue due to increased distribution of central heating and cooling systems and an increase of urban population. Since combustion of gases leads to much lower emissions of sulfur oxides and nitrogen oxides than from heavy oil or coal the demand for town gas may increase. To meet this demand the Tokyo Gas Co., Ltd. has imported liquid natural gas from Alaska and Indonesia since 1969 and is planning to build LNG factories, pipelines, and adjust the burners of users. A production capacity of 1.6 million cu m/day will be completed soon. A total of 250 km of pipeline will be installed around Tokyo bay by 1976.

39086 **APTIC NO. 62481**

Toyama, Akio

DIRECT DESULFURIZATION SYSTEM-STRUCTURE OF THE MAIN EQUIPMENT AND COST ESTIMATION METHOD. *(Chokusetsu datsuryu sochi-shuyo kiki no* *kosei to gaisanho). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(6):17o23, June 1974.*

The main equipment, structure, cost factors, and cost estimate methods for the direct method of fuel oil desulfurization are discussed. The major apparatus constituting a desulfurization system are: the reaction tower, the heat exchanger, the heating furnace, high pressure tower tanks, the air cooler, the compresser, and the piping system. The most economical way of constructing the reaction tower is a combination of the cold wall method and multi-layer cylinders. This method is unsatisfactory, however, and now a combination of the hot wall method and forged rings, or the hot wall and plate methods, are much safer and technically satisfactory. The effluent heat exchanger requires very few flange connections; there is little chance of startup-shutdown gas leakage, it requires a smaller area for installation, the exchanger itself is compact, and the cost is lower. For heating tubes, the early problems of corrosion, refraction, and carbides have been solved to some extent. Austenite stainless steel with a columbium or titanium additive seems to be reliable and safe. In designing heating furnaces, the flow pattern of the fluid in the heating tube must be completely investigated. Provision of a minimum number of checking points is very important. The high pressure tower is most economical when multi-layer cylinders are used. The ratio of various construction process costs in the total construction cost is presented.

39087 **APTIC NO. 62859**

Trenkler, Harro

NON POLLUTING USE OF PRIMARY ENERGIES -A TASK OF ELECTRIC POWER COMPANIES. *(Umweltfreundliche Nutzung der Primaerenergien - eine Aufgabe der Elektrizitaetswirtschaft). Text in German. Elektrizitaetswirtschaft, 73(11):287-293, 1974. 18 refs.*

In the Federal Republic of Germany power plants consumed in 1970 about 25% of the total primary energy demand but contributed only 9% to the total emission. The reason for this is the optimum conduction of the combustion process in power plants and the highly efficient dust separation. The contribution by power plants to the total emission is only 1.3%, to the sulfur dioxide emission less than 10%. An increasing substitution of fossil fuels by electric power thus will reduce emissions drastically. However the discharge of low-temperature heat grows proportionally with the power production in thermal power plants. On the other hand low-temperature heat is produced in numerous domestic heaters by combustion of fossil fuels at high temperatures. Use of this waste heat for the supply of home heat would therefore be desirable but it is presently still scarcely practiced because it would require a temperature increase of the power plant waste heat, an economical heat transport to the consumers and heat storage during summer season.

39088 **APTIC NO. 62389**

Ulrich, Rudolf and Manfred Mittelstrass

SUBSTANCE TRANSFER AT THE ADSORPTION IN THE FLUIDIZED BED. *(Beitrag zur Stoffuebertragung bei der Adsorption im Fliessbett). Text in German. Chem. Tech. (Berlin), 25(5):278-282, May 1974. 16 refs.*

Based on the equations describing the substance transfer in an individual layer of a fluidized bed absorber the substance transfer in the entire apparatus can be calculated. Prerequisite for this is the validity of the assumptions on which the system of equations for the substance transfer in the individual layer is based. Valid also must be the assumptions that between the layers a complete mixing of the fluid medium takes place so that a concentration gradient perpendicular to the flow direction exists and that all adsorbent particles carry the same load prior to entry into the next layer. The results of the calculation were compared with results obtained experimentally with the system air-carbon dioxide Zeosorb 4A in a scaled-down fluidized bed column. The derived equations described the experimental results of fluidized bed adsorption with satisfactory accuracy provided the kinetic data and equilibrium parameters were given.

39089 **APTIC NO. 62153**

Vesely, Vaclav

MOTOR FUELS AND ENVIRONMENTAL PROTECTION. *(Motorenkraftstoffe und Umweltschutz). Text in German. Erdoel Kohle-Erdgas- Petrochemie, 27(5):259-261, May 1974. 7 refs.*

The reduction of pollutants from the exhausts gases of combustion engines can be achieved by improvements in the engines, by use of filters, by thermal or catalytic reactors for exhaust gases, and through improved fuels. For gasoline, three cases are discussed. The presence of lead in the gasoline is not harmful to the environment: actual processes can still be used, e.g., the isomerization of n-alkanes and the reforming of naphthas. The lead must be reduced or eliminated: new antiknock additives are desirable, but all of them proposed so far on the basis of iron, manganese, aromatic amines, alcohols, or water have some drawbacks; the way to aromatic gasolines seems to be indicated. The content of lead must be nil, regulations are getting tougher: aliphatic gasolines seem to be the solution. For diesel fuels, at the distillation end, the content of aromatic and sulfur compounds must be sharply reduced. Additives against the formation of soot are desirable but problems still remain. The combustion temperature should be lowered, possibly through the use of water. Combustion cells seem to present an ideal solution to the environmental problems without impairing efficiency, but their use is still far off.

39090 **APTIC NO. 62888**

Viehrig, J.

PROCESS TECHNOLOGICAL ASPECTS AT THE COMBUSTION OF HIGHLY CONCENTRATED POLLUTANT MIXTURES. *(Verfahrenstechnische Aspekte bei der Verbrennung hochkonzentrierter Schadstoffgemische). Text in German. Technik (Berlin), 29(6):385-388, June 1974. 3 refs.*

For the non-polluting elimination of small quantities of highly toxic gases, firing systems available in an industrial plant can be used provided certain design features and safety aspects are taken into account. For determination of whether an existing firing system is suitable for this purpose the heating value of the gas mixture must be calculated as well as the air demand of the combustion. The calculation of these two parameters is discussed. Through combustion of the gaseous pollutants the waste volume is increased and the dew point might be shifted. The calculation of these two factors is described. The values for the explosion limits and the ignition temperature for individual substances can be taken from the literature and the lower explosion limit for gas mixtures can be calculated according to Oehley. Knowledge of whether or not the supplied gas mixture exceeds the lower explosion limit will determine the safety measures to be taken.

39091 **APTIC NO. 62500**

Vogel, Roger F., Bruce R. Mitchell, and Franklin E. Massoth

REACTIVITY OF SO2 WITH SUPPORTED METAL OXIDE-ALUMINA SORBENTS. *Environ. Sci. Technol., 8(5):432-436, May 1974. 9 refs.*

A number of impregnated metal oxides supported on alumina were evaluated for removal of sulfur dioxide at 343 C from a mixture containing oxygen, nitrogen, water, and sulfur dioxide. A fixed-bed, flow reactor waas used to simulate a stack gas with the effluent monitored for SO2 removal by infrared analysis. A kinetic treatment of the system was developed and rates of SO2 sorption were calculated. A 5% SO2 breakthrough point was chosen for practical rating of the various sorbents. The relative capacities of the sorbents were in general agreement with those of bulk oxides in that the alkali and alkaline earth metals were superior in reactivity. Compared to the Bureau of Mines coprecipitated, alkalized alumina, the sodium-impregnated alumina sorbent had a much higher rate for SO2 sorption. Supported copper and strontium proved to be especially reactive. The supported manganese and cobalt sorbents were not as active as the copper, contrary to results previously reported for bulk oxides. The presence of water vapor affected the capacity of several sorbents. (Author abstract modified)

39092 **APTIC NO. 62151**

Walkenhorst, Wilhelm

STUDIES CONCERNING ADHERENCE OF DUST PARTICLES. *(Untersuchungen ueber den Haftgrad von Staubteilchen). Text in German. Staub, Reinhaltung Luft, 34(5):182-186, May 1974. 5 refs.*

An obstacle made of wire or in the form of a net is provided with an adhesive layer. The degree of adhesion of glass spheres or coal particles is measured at a flow velocity between about 1.5 and 13 m/sec. The degree of adhesion depends on the type of particles, the flow velocity, and the ratio of adhesive to dust. For coal dust the maximum degree of adhesion is 90%. For glass spheres it is only 72%. For flow velocities greater than 10 m/sec the adhesion decreases in both cases. Without adhesives the degree of adhesion at velocities greater than 4 m/sec is zero. For highest possible dust retention the ratio of dust to oil may not exceed 0.6. For optimum operation of a filter, therefore, frequent cleaning and renewed application of oil are required. Vegetable oils may be used as adhesives but mineral oils are also suitable. Vaseline is not to be used.

39093 **APTIC NO. 62862**

Wanger, H.

THE STATE OF ENVIRONMENTAL PROTECTION AT GRESSEL AG. *(Die Umweltschutzsituation bei der Gressel AG). Text in German. Schweiz. Tech. Z., no. 13:256-257, March 1974.*

The state of the art of environmental protection as implemented at Gressel AG, a small metal-processing plant with 120 employees, is described. Hardening operations, a source of toxic air pollutant emissions, have been abandoned due to the highly limited demand. The nitrous gas emissions, characteristic of conventional brass-dipping plants, were eliminated by the switchover from the nitric acid-sulfuric acid system to chromic acid.

39094 **APTIC NO. 62520**

Watanabe, S.

SUMMARY ON DEODORING WITH A DIRECT COMBUSTION METHOD. *(Chokka nensho hoshiki ni yoru dasshu no gaiyo). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(13):7-15, Jan. 1974.*

The direct combustion method is used for deodorizing of organic solvents emitted from a metal painting process and was developed as the afterburning method in America. In 1962, an after heat burner for a fume incinerator was developed and was combined with the combustion techniques of the S. T. Johnson Co. to make a deodorizing machine with the direct combustion method. Its burning temperature is 650-760 C. It is 550-650 C for ammonia, 600-700 C for carbonic acids and 680-730 C for aldehydes. A sample containing 8.9 ppm of formaldehyde is reduced to 0.49 ppm at 700 C and to 0.01 ppm at 750 C. The efficiency is not always sufficient even if it is over 99.9%, since this corresponds to 90% reduction of odor intensity according to Weber-Hefner s law. The main problem of this method is running cost. When a heat convertor is used, the running cost of deodorizing machine is $3.09/hr.

39095 **APTIC NO. 61776**

White, Harry J.

RESISTIVITY PROBLEMS IN ELECTROSTATIC PRECIPITATION. *J. Air Pollution Control Assoc., 24(4):314-338, April 1974. 51 refs.*

High resistivity particles are one of the most common causes of poor precipitator performance. A coherent up-to-date account is given of the problems of high resistivity particles and the basic methods for dealing with them. Historical background, measurement of resistivity by the point-lane and concentric-cylinder methods, field and laboratory resistivity data, conduction mechanisms, surface conduction, back corona, sparkover, current-voltage disturbances, effects with positive corona, effects of high resistivity on precipitator performance (electric operation, particle charging, and particle collection), and methods for overcoming high resistivity (clean electrode methods, electrical energization methods, conditioning methods, systems methods, wet methods, temperature-controlled electrodes, and graded-resistance electrodes) are discussed. Both theory and practice show that precipitator design should be coordinated with particle resistivity conditions in order to obtain expected efficiency. Where this has not received adequate attention, precipitator efficiencies as low as 60 or 70% occur instead of design values of 99 or 99+%. Resistivity should be measured in present plants were high resistivity is suspected as a problem, and new plants should be designed to eliminate this problem. Control methods include conditioning with moisture and/or certain chemicals, improving electrical energization of the precipitator, changing precipitator operating temperature to a more favorable zone, changes in raw materials used in the process, correcting gas flow problems if such exist, and using larger size precipitators. In some cases wet collection may be the method of choice in obviating high resistivity problems.

39096 **APTIC NO. 61608**

Willemsen, Friedrich

WASTE GASES DISPOSAL FOR TOPBLOWN OXYGEN CONVERTERS. *(Verfahren und Vorrichtung zur Absaugung der beim Sauerstoffaufblasverfahren entstehender Abgase). Text in German. (August Thyssen-Huette AG, Duisburg (West Germany)) W. Ger. Pat. 2,226,432. 4p., May 9, 1974. 2 refs. (Appl. May 31, 1972, 2 claims).*

A device for the afterburning of topblown oxygen converter-generated flue gases without a suction hood is described. The waste gases are passed into a waste heat boiler with a polygonal cross section, where compressed air is blown in upward at the corners. The equipment does not interfere with charging and other operations.

39097 **APTIC NO. 61709**

Wilson, Wallace E.

AUTOMOTIVE POWER PLANTS. THE LONG-TERM OUTLOOK. *Eng.: Cornell Q., 8(4):39-44, Winter 1974.*

Various automotive power plants are reviewed with respect to economics, thermal efficiency, and emissions. Energy consumption and emission control must be considered along with performance, cost, and durability. In 1900, gasoline diesel and spark ignition engines had more technical and economic advantages than steam and electric cars. Now that emission control and energy consumption are important factors, steam and electric engines are becoming more feasible. The steam or Rankine cycle engine appears to be one of the least promising proposed automotive power plants, however, due to its fuel economy, weight, size, water consumption, and nitrogen oxide emission problems. The Stirling engine has high efficiency, is quiet, its major components are durable, and its hydrocarbon and carbon monoxide emission are low. Disadvantages are the large radiator, weight, the hydrogen or helium working fluid is difficult to seal for life, and the engine is complicated and expensive. Battery electric power plants simply transfer the problem of pollution from the automobile tailpipe to the smokestack of the central electric power station. Fuel cells may be the best alternative in the long run, since emissions are low, and efficiency is good. Disadvantages are limited range, high cost, and low power output per unit of weight and volume. While gas turbines are approaching commercial feasibility for trucks, buses, and other heavy-duty vehicles, they are too-heavy, too expensive, and accelerate too poorly for automobiles. Diesel engines are being studied, but have high initial cost, smoke, odor, and other problems. Stratified charge engines give low CO emissions and good fuel economy, but have poor driveability, high hydrocarbon emissions, and other diadvantages. Rotary engines are the closest to volume production. However, the major emphasis is still on adding retrofit devices to control piston engine emissions.

39098 **APTIC NO. 62440**

Wilt, C. R.

HEAT RECOVERY AND EMISSION CONTROL THROUGH INCINERATION. *Iron Steel Engr., 51(5):67-70, May 1974. 7 refs.*

Some waste gases such as coke oven or blast furnace gas can be recovered and used as fuel. Waste gases from many other processes do not have the heat content to justify their recovery as fuel, but when these gases are oxidizable to acceptable combustion products, incineration should be considered as a method of heat recovery and elimination of pollutants. Considerable work has been done in establishing the flammability characteristics for various gases. Of particular interest is a study of the effect on the flammability limits of various inert gases such as carbon dioxide, nitrogen, and water vapor. Three methods of incinerating a hydrocarbon/air or an air and waste gas mixture are described. In the first, the entire mixture is brought within flammability limits by adding a fuel. If the process effluent is at 25% of the lower limit of flammability, a minimum of three parts of equivalent fuel would be required. In the second method, a fuel supply should be supplied with an auxiliary stoichiometric or partially stoichiometric air source to combust and mix with the effluent. In the third method, a portion of the mixture is brought within the flammability limits by adding fuel and then remixing to produce the required temperature to permit the balance of the effluent to oxidize. This is the best scheme.

39099 **APTIC NO. 62551**

Wootton, Anthony G.

CONTROL OF EXHAUST EMISSION FROM GASOLINE ENGINES: THE STATE OF THE ART AND POINTERS TO THE FUTURE. *Fuel, 53(2):67-73, April 1974. 6 refs.*

Current state of the art as well as possible future developments in the control of exhaust emissions from gasoline engines are reviewed for both the United States and Europe. Oxidation catalysts to deal with carbon monoxide and hydrocarbons are now certain to be used at least in California in 1975 and throughout the entire United States in 1976, with the problem of catalyst poisoning largely overcome by the availability of unleaded gasoline. Most manufacturers are concentrating their efforts on platinum-type catalysts promoted with palladium or similar metals. The typical emission-control system designed to meet currently expected 1977 United States Federal limits will consist of a dual catalyst-bed arrangement. New types of internal combustion engines such as the stratified-charge type are being developed to approach emission control from the standpoint of increased combustion efficiency. The Honda CVCC (Compound Vortex-Controlled Combustion) system appears to be the most promising, with no additional control systems being needed except for reaching the original 1976 nitrogen oxide levels. Steam engines, gas turbines, Stirling engines, electric hybrid units, and battery-powdered motors are among possible alternatives being considered to the internal combustion engine.

39100 **APTIC NO. 61795**

Yamada, Tamotsu, Kenji H[illegible]mano, and Takaya Iida

THE EFFECTS OF ADDITIVE SALTS ON LIMESTONE ABSORPTION OF SULFUR DIOXIDE. *(Sekkaisekirui no SO_2 kyushu ni taisuru tenkaen no koka ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 671, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G07.)*

The temperature of sulfur dioxide can be lowered in the lime-desulfurization process and the reaction speed is enhanced when alkaline metal halogen compounds are added to the lime. The reaction mechanisms of such salts on lime and on desulfurization were studied. Limestone, quicklime prepared from limestone by baking at a low temperature, commercial quicklime, and slake lime were used. The SO_2 absorption formation was checked by x-ray refraction, infrared analysis, and chemical analysis. The reactions of additive salts were checked by DTA and x-ray refraction. The reaction of limestone was affected by particle sizes. The formed calcium oxide showed an almost complete reaction with SO_2, but during decomposition of calcium carbonate and calcium oxide, SO_2 absorption was obstructed by $CaSO_3$ and $CaSO_4$ formation on the particle surface. Slake lime activity showed no decrease of SO_2 absorption, probably because of extremely small particles. Additive salts lowered reaction temperature for limestone and quicklime, and increased the reaction rate and speed. Potassium chloride showed the greatest effect on temperature, absorption rate, and absorption speed, but KCl had no effect on slake lime. Addition of KCl, sodium fluoride, sodium chloride, or calcium chloride was effective in lowering the temperature of SO_2 in desulfurization process lime, and enhanced the rates and speeds of reaction; these salts probably melted together with II $CaSO_4$ which formed on the surface of lime and increased dispersion of SO_2.

39101 **APTIC NO. 59368**

Yoshida, Koji, Suteichiro Saeki, Takenobu Sekido, Yujiro Minami, and Takao Hishinuma

HITACHI FLUE GAS DESULFURIZING SYSTEMS. *Hitachi Rev. (English translation from Japanese of: Hitachi Hyoron), 23(3):99-108, 1974.*

Technological features and applications are outlined for each of the Hitachi flue gas desulfurizing systems (DESOX series). The series consists of the sodium sulfate waste system, the sodium gypsum system, the semi-wet soda system, the wet activated carbon system, the dry activated carbon system, and the limestone-gypsum system. All of the systems utilize absorption and/or adsorption agents and are prepared for a broad range of capacities. Applications range from use with general industrial boilers to employment in such specialized areas as the glass industry and the pulp industry. The wet activated carbon system is currently under development.

39102 **APTIC NO. 61861**

Yoshida, Tetsuo

SCRUBBER. *(Sukuraba). Text in Japanese. Preprint, Japanese Society of Materials Science, Kyoto, p. 179-194, 1974. (Presented at the Symposium on Pulverization and Dust Control, Kyoto, Japan, Feb. 20-21, 1974.)*

Aspects of a scrubber ranging from the fundamentals to the types of scrubbers actually in use are discussed. For effective dust collection, the dust particulates have to be wetted. Selection of the proper scrubbing solution, electrostatic treatment of the dust particulates, condensation, and growth of the dust particulates are discussed in this connection. The basic mechanism, construction, and performance of a floating bed scrubber, a bubble tower scrubber, a packed tower, a venturi scrubber, and a two-stage venturi scrubber are all described. The relationship between the total investment, running cost, and performance of 21 different types of dust collectors was calculated and plotted on a logarithmic chart. Wet dust collectors are generally higher in performance, but also higher in cost.

39103 **APTIC NO. 61898**

Yoshizu, Hideo, Tadahiko Fukuyama, Takeji Oguri, and Yasuo Takagi

THE EVALUATION OF HC/CO OXIDIZING CATALYTIC CONVERTER SYSTEM. *(HC/CO sanka shokubai sochi no hyoka). Text in Japanese. Nissan Giho (Nissan Tech. Rev.), no. 9:74-80, Feb. 1974. 2 refs.*

Using basic experimental data of various catalysts, a simple mathematical model for evaluation of performance of hydrocarbon/carbon monoxide converter devices was obtained. The mathematical model is explained. A performance prediction simulation is also discussed. Simulation input data are: gas properties (specific heat, density), gas flow quantity, secondary air, carbon monoxide concentration, carbon dioxide concentration, hydrocarbon concentration, nitrogen oxides concentration, gas temperature, exhaust circulation rate, catalyst installation location, catalyst properties (specific heat, density, porosity, volume), and several actual curve measurements. The calculation procedure includes input data reading, s-curve determination, gas temperature adjustment, recirculation effectiveness, determination of catalytic carrier temperature, purification rate calculation, space velocity purification rate adjustment, and exhaust gas purification calculation. The calculation of gas temperature is a little higher than actual measurement. An estimate for catalyst cost is also presented by equation.

39104 **APTIC NO. 62119**

Zenner, B.

EXPERIENCE WITH DUST COLLECTION FROM SHAFT KILNS. *(Erfahrungen mit der Entstaubung von Schachtoefen). Text in German. Zement-Kalk-Gips (Wiesbaden), 27(4):165-171, 1974. 8 refs.*

Examples are taken from the lime industry to show which dust collection systems have been installed for cleaning the exit gases of conventional coke-fired shaft kilns, annular shaft kilns, double inclined shaft kilns, uniflow-counterflow regenerative kilns, and other recent types of lime kiln, and the experience gained with those systems is reported. Newer types of dust collection equipment, the installation of which is planned for the future, are also described. For annular shaft kilns gravel bed filters, spinning layer filters, cloth filters, scrubbers, and electrostatic precipitators are in use in the Federal Republic of Germany. Difficulties with the gravel bed filter primarily through rapid wear of the sealing sleeves led to development of the spinning layer filter. However, in Southern Germany many annular shaft kilns are still cleaned by gravel bed filters. The spinning layer filter can be operated with a much higher load per filter area than the gravel bed filter, but they consume more space. Double inclined shaft kilns are also mostly cleaned by gravel bed and spinning layer filters. The gravel bed filters are being replaced presently mostly by cloth filters with preceding cooler. Good experiences were had with spinning layer filters in these kilns. Uniflow-counterflow regenerative kilns are in use primarily in Japan, France, Belgium, and Spain. They are equipped with scrubbers or cyclones for dust collection. The first such kiln in Austria received a gravel bed filter. Conventional kilns are mostly cleaned by scrubbers. A cost comparison of the various methods yields investment costs of $60/cu m h for cloth filters with air jet cleaning and cooler, of $150 for electrostatic precipitators. The operating costs are lowest for electrostatic precipitators with 28 cents/ton lime. The maintenance costs are highest for cloth filters (28 cents/ton lime). The operating costs for cloth filters, scrubbers, and spinning layer filters are about the same.

39105 **APTIC NO. 61008**

AMAGASAKI COKES PROGRESSING TOGETHER WITH THE PROSPERITY OF THE SOCIETY. *(Amagasaki Kokusu). 1974 (?). Translated from Japanese, 33p.*

The Amagasaki Coke Company facilities are described, and pollution control methods are discussed. The factory is attempting to improve the environment by planting trees, using wet and dry desulfurization techniques, recovering ammonia from coke oven gas, collecting naphthalene and benzol in scrubbers and recovering light oil fractions, removing hydrogen cyanide in a decyanization tower, removing hydrogen sulfide, and collecting dust. A greenhouse, Japanese garden, and flower garden have been planted as a green belt for the factory. The dust collecting facility for coke guide car dust is the first scrubber/wet electrostatic precipitator in the world for preventing dust during the discharge of coke from the oven. Charts are given for the factories showing the major facilities, their type, and capabilities; coke ovens, coolers, ammonia scrubber, absorber, benzol scrubber, wet and dry desulfurization facilities, decyanization tower, and other facilities are included.

39106 **APTIC NO. 62075**

Tennessee Valley Authority, Muscle Shoals, Ala., Technical Library

SELECTED PROCESS FOR REMOVAL AND/OR RECOVERY OF S COMPOUNDS FROM FUEL GASES (1955-1974). *TVA Bibliography 1402, 4p., 1974. 53 refs.*

A bibliography of selected processes for removal and/or recovery of sulfur compounds from fuel gases is presented. The references cover the years 1955-1974. The processes include: Benfield, Claus, Scot, Giammarco-Vetrocoke, Stretford, and combined or compared processes.

39107 **APTIC NO. 62133**

Fuel Society of Japan, Tokyo, Japan Boiler Assoc., Osaka, and Fuel and Combustion Co., (Japan)

PROCEEDINGS OF CONFERENCE ON CONTROL MEASURES OF OXIDES OF NITROGEN (NOx). *(Chissosankabutsu (NOx) no boshi taisaku ni kansuru zadankai kiroku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(4):343-368, April 1974.*

Environmental and emission criteria for oxides of nitrogen, various NOx control measures, and NOx measurement methods are discussed. In the thermal power plants of the Kansai Electric Power Co., existing boilers are being modified to incorporate two-stage combustion and exhaust gas recirculation systems for reduction of NOx emissions. The modification work is expected to be completed by June, 1974 and reduce the NOx emission 40-50%. The new NOx emission criteria are 230 ppm for the existing heavy oil boilers and 180 ppm for those newly installed. The three main factors contributing to increase of NOx formation are temperature, oxygen, and carbon (TOC). This TOC effect is discussed with a view toward suppression of NOx emission. The caloric burner can reduce NOx emission by 40-50%. While development of NOx-reducing burners is still desired, there is a limit to reduction of NOx by means of the burner or combustion method, no matter how much they may be improved. The denitrization methods including the low-temperature combustion method and the wet type absorption by active carbon catalyst are reviewed. Also reviewed in NOx removal by composite catalyst and potassium permanganate. The NOx measurement method using electrolytic potential is also discussed.

39108 **APTIC NO. 62171**

PART II WASTE DISPOSAL CENTRAL PROBLEM OF OUR TIME. *(Teil II Abfallbeseitigung zentrales Problem der Gegenwart). Text in German. Wasser Luft Betrieb, 18(3):143-148, 1974. 3 refs.*

Afterburners, mainly for thermal or catalytic oxidation of hydrocarbon-containing waste air from lacquering processes, and incinerators such as the variable zone feed/step incinerator, an incinerator for hospital waste, a steam generator for 17.5 ton/hr steam, a fluidized bed incinerator and transportable incinerators are described. For the installation of thermal and catalytic afterburners at lowest possible investment costs knowledge of the composition of the emissions is essential. A balance chart for economic installations for heat recovery is given which is based on a circulating air quantity of 25,000 cu m/hr, a temperature range of 200 to 180 C, a waste air quantity of 5600 cu m/hr, a waste air temperature of 4200 kcal/cu m, and a solvent quantity in the waste air of 50 kg/hr. If the waste air is a multi-component mixture which changes its composition frequently, or if the pollutant concentration in it is low enough, combustion of the waste air mixture is doubtlessly the most economic disposal method. The incinerator for hospital waste is located in Cologne. It comprises two furnace units and a water tube boiler generating hot steam from the waste heat. In cases where no heat utilization is feasible waste ashing is of advantage because it leaves inert incineration residues. The flue gas heat can be used for drying sewage sludge which is to be ashed jointly with trash. Such ashing plants usually have an afterburning chamber for complete combustion of the flue gases at temperatures above 800 C. For cooling and cleaning the flue gases indirect cooling systems with air and following scrubber, evaporation coolers with electrostatic precipitators, or radiation coolers with electrostatic precipitator are available.

39109 **APTIC NO. 62172**

Kali-Chemie Engelhard Katalysatoren GmbH, Hannover (West Germany)

EXPERIMENTS WITH THE CATALYTIC PURIFICATION OF WASTE AIR FROM DRYING FURNACES. *(Versuche zur katalytischen Reinigung von Abluft aus Trockenoefen). Text in German. Gesundheitstech., 1974(1):14- 16, 1974.*

A method was developed and tested which removes phosphoric acid from a waste gas flow by adsorption. The solvents in the waste gas flow are then removed by catalytic afterburning. The proprietory adsorption agent is theoretically capable of adsorbing a phosphoric acid quantity of 150% of its own weight. For the laboratory experiments the adsorbent was accommodated in a quartz vessel with a diameter of 3.3 cm and a cross section of 8.7 sq cm. The vessel contained 78 ml of the adsorbent in six layers separated by a narrow-meshed wire mesh. The quartz vessel was in a salt bath which had a steady temperature of 350 C. The laboratory experiments were successful and large-scale experiments followed. For these the waste gas flow was divided with one branch passing the adsorbent the second branch passing an inert substance. Both branches then passed the same quantity of catalyst. The gases entered the catalysts with a temperature of 350 C. The experiments lasted from October 23, 1970 to December 10, 1970. During a total of 540 operating hours 8.6 tons of solvents were consumed. Two of the used lacquers contained phosphoric acid, so that during this period 3.75 kg phosphoric acid were entered into the furnace. In each waste gas branch the calculated phosphoric acid concentration was about 5 g. It was found that the concentration after the catalyst was in both cases below the required 300 mg C/cu m. Further longer experiments revealed that the removal of phorphoric acid from waste gas flows is technically feasible. The costs for the adsorber do not raise the costs for catalytic afterburning. The results of catalytic afterburning with and without prior removal of phosphoric acid were the same. The phosphoric acid concentration in waste gases usually found in the packing industry is not high enough to shorten the life-time of the catalyst in any major way.

39110 **APTIC NO. 62336**

Radian Corp., Austin, Tex.

REPORT ON THE STATUS OF LIME/LIMESTONE WET SCRUBBING SYSTEMS. (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-0046, Environmental Protection Agency-450/3-74-014, 44p., Jan. 1974. 20 refs.*

NTIS: PB-232087/AS

The statuus of lime and limestone wet scrubbing systems for the removal of sulfur dioxide from flue gases of fossil fuel-fired steam generators is summarized. The history of the systems, dating back 40 yr, is reviewed. A general description of current lime and limestone wet scrubbing processes is given with a discussion of the similarities, advantages, and disadvantages of each process. Operating histories of six recent systems are presented. Solutions to problems of scrubber and pipe plugging, chemical scaling, corrosion and erosion, and demister and reheater operating problems are discussed. There are currently 12 vendors offering lime/limestone wet scrubbing systems for commercial application. Seven of the 12 already have full-scale experience. The suppliers were surveyed to assess the range of operating conditions being offered with their systems. Contacting devices for SO2 absorption include venturies, marble beds, quencher plus tray absorber spray columns, TCA, and inspirating scrubbers. Most systems can be designed for boilers firing 0.5 to 4.0% sulfur fuel. (Author abstract modified)

39111 **APTIC NO. 62576**

Committee on Bag Filter Studies

REPORT ON TECHNICAL INVESTIGATIONS OF BAG FILTERS. *(Bagu firuta no gijutsu chosa hokoku). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 11(8):1-59, March 1974. 19 refs.*

A comprehensive study on technical and mechanical aspects of various types of bag filters is presented with diagrams, graphs, tables, mathematical analyses, and references. The topics of discussion includy particle sizes and size distribution, Brownian movement of dusts and dispersion calculation methods, characteristics and mechanical properties of filter fabrics and selection methods, the mechanism of dust capturing by fiber layers, filtering speed and calculation methods, filtering area and calculation methods, various types of dust shaking methods and structures of apparatus, filtering of high temperature gas, maintenance and management of bag filters, bag filter operation control, economy of bag filters, fire prevention and safety, selection and handling of electric motors, data analyses of bag filter users questionnaire responses, air viscosity and density, water viscosity and specific weight, particle size and precipitation speed in the air, the thickness of filter fabric, and measuring methods.

39112 **APTIC NO. 62755**

(Inventor not given.)

THE PURIFICATION OF GASES BY A PROCESS INVOLVING ADSORPTION. *(L Air Liquide Societe Anonyme pour L Etude et L Exploiration des Procedes George Clause, Paris (France)) Brit. Pat. 1,346,178. 7p., Feb. 6, 1974. (Appl. Dec. 3, 1970, 5 claims).*

A process for the purification of purge gas originating from ammonia synthesis installation is described in which one of the components of the gas, e.g., hydrogen, is recovered. Where the purge gas contains impurities, e.g., ammonia, of which the desorption is particularly difficult, and which have a tendency to poison the adsorbent, known methods do not give complete satisfaction unless very large quantities of purified hydrogen are passed through the adsorbent mass to be regenerated. This process overcomes that problem because it permits the maximum use of the expansion effect for the regeneration of the mass and permits a reduction in the quantities of purified hydrogen which are necessary for bringing the desorption to completion.

39113 **APTIC NO. 62759**

(Inventor not given.)

PNEUMATIC DUST EXTRACTION INSTALLATION. *(Gebrueder Buehler AG, Uzwil (Switzerland)) Brit. Pat. 1,347,060. 16p., Feb. 13, 1974. (Appl. Aug. 26, 1971, 18 claims).*

An improved pneumatic dust extraction installation was developed. It has a dusty air chamber, a scavenging air chamber, and a clean air chamber adjoining one another axially and separated from one another by partition walls. There is a flexible filter tube or filter hose in the dusty air chamber which connects the clean air chamber to the scavenging air chamber. In other apparatuses of this type, the scavenging air chamber can be filled with scavenging air only when a scavenging air surge is triggered, so that in the filter hose a positive pressure can only be gradually built up by the scavenging air, which greatly reduces the cleaning effect. This installation produces a positive pressure by the scavenging air suddenly in the filter hose by means of an inflatable annular diaphragm.

39114 **APTIC NO. 62766**

(Inventor not given.)

AIR CLEANER ASSEMBLY. *(Ford Motor Co., Ltd., London (England)) Brit. Pat. 1,345,888. 4p., Feb. 6, 1974. (Appl. Aug. 3, 1971, 5 claims).*

An engine air cleaner assembly for a motor vehicle was developed. It is increasingly difficult to use conventional engine constructions having a carburetor and air cleaner superimposed. This cleaner eliminates the problem because it is located at the side of the carburetor instead of above it. The assembly traps excess fuel vapors and subsequently redirects them back into the engine to be consumed rather than vented freely to the atmosphere. The need to locate a carbon canister outside of the air cleaner is eliminated.

39115 **APTIC NO. 62768**

(Inventor not given.)

PROCESS FO?R REMOVING ACID CONSTITUENTS FROM GASES. *(Heinrich Koppers Gesellschaft mit Beschrankter Haftung, Essen (Germany)) Brit. Pat. 1,342,836. 4p., Jan. 3, 1974. (Appl. April 19, 1971, 4 claims).*

A process for the removal of acid constituents such as carbon dioxide, hydrogen sulfide, and hydrogen cyanide from gases by absorption with a washing agent is described. In other processes the use of the chemically acting washing agents is frequently uneconomical because when the acid constituents are removed from the washing agent to regenerate the latter, the chemical bond which was formed during the washing process has to be destroyed at a considerable amount of heat energy. A washing agent was developed which is capable of being regenerated with a reduced heat energy and which has a special selectivity with respect to H2S. The agent includes a carboxylic acid amide of morpholine, the carboxylic acid of which amide has 1-7 carbon atoms.

39116 **APTIC NO. 62769**

(Inventor not given.)

AN ARRANGEMENT FOR PURIFYING EXHAUST GAS OF AN INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima-Ken (Japan)) Brit. Pat. 1,342,306. 9p., Jan. 3, 1974. (Appl. Jan. 14, 1971, 8 claims).*

An arrangement for purifying exhaust gas of an internal combustion engine is described. There is a means of supplying secondary air to the exhaust system in response to operating conditions such as engine temperature, and speed, together with a control means to stop or delay ignition by means of one of two ignition plugs provided in a common combustion chamber in an internal combustion engine, in response to the aforementioned operating conditions. If ignition by one of the two ignition plugs is retarded although the power output of the engine is somewhat reduced, the removal of the unburned detrimental components of the exhaust gas is improved. If ignition is stopped, although the power output of the engine is further reduced, the removal of the unburned detrimental components of the exhaust gas is further improved.

39117 **APTIC NO. 62785**

(Inventor not given.)

PROCESS FOR RECOVERY OF SULPHUR FROM SULPHUR DIOXIDE. *(Canadian Industries, Ltd., Montreal, (Quebec)) Brit. Pat. 1,343,681. 5p., Jan. 3, 1974. (Appl. April 19, 1971, 8 claims).*

A process for recovering elemental sulfur from sulfur dioxide-containing gases is described. The SO2 is catalytically reduced in a multi-stage process in the presence of a gaseous hydrocarbon. The operating efficiency of the process is greatly increased by making from 40-50% of the SO2 bypass the first stage. There is an economic gain in restricting the proportion of the SO2 reactant passing into the first stage reactor which is the main improvement of this process over similar multistage methods.

39118 **APTIC NO. 62786**

(Inventor not given.)

REMOVAL OF HF FROM AN HF-CONTAINING GAS. *(Du Pont (E.I.) de Nemours, Wilmington, Del.)) Brit. Pat. 1,342,703. 3p., Jan. 3, 1974. (Appl. May 12, 1972, 10 claims).*

A process for the removal of hydrogen fluoride from an HF-containing gas is described. The HF-containing gas is contacted with water to form an aqueous HF solution. The solution is neutralized with calcium hydroxide, calcium carbonate, or mixtures of them in the presence of calcium sulfate. The presence of CaSO4 is an improvement over other systems using Ca(OH)2 because the sulfate alters the gelatinous nature of the precipitate to a form which settles more rapidly and which is more readily filterable from the aqueous solution.

39119 **APTIC NO. 62787**

Aoi, Katashi

IMPROVEMENTS IN OR RELATING TO EXHAUST GAS CLEANING APPARATUS FOR AN INTERNAL COMBUSTION ENGINE. *(Assignee not given.) Brit. Pat. 1,347,421. 6p., Feb. 20, 1974. (Appl. Feb. 4, 1972, 17 claims).*

An exhaust gas cleaning apparatus for an internal combustion engine is described in which the exhaust gas is cooled. Some cleaning systems use the principles of cyclone effect and adiabatic expansion effect in various combinations resulting in cooling of the exhaust gas to such an extent that condensation of moisture occurs and the noxious substances and pollutants in the exhaust gas are dissolved or dispersed in the condensate. Noticeably more efficient cleaninng of the gas can be achieved by the present method which employs auxiliary cooling of the cleaning chambers in the peripheral regions.

1973

39120 **APTIC NO. 62777**

Aio, Katashi

IMPROVEMENTS IN OR RELATING TO THE PURIFICATION OF INDUSTRIAL WASTE GASES. *(Assignee not given.) Brit. Pat. 1,308,800. 7p., March 7, 1973. (Appl. Dec. 22, 1970, 14 claims).*

A method and apparatus for purifying gaseous effluents from industrial plants prior to release of the effluent to the atmosphere through a chimney stack are described. The gases are passed under pressure through an adiabatic expansion chamber located with a cooling vessel. Sulfur dioxide and hydrocarbon gases can be removed from the waste gases by passing them through the apparatus in which they will be liquefied. The liquefaction is effected by cooling the gaseous effluent to a temperature at which the undesirable components will liquefy with greatest efficiency. The cooled atmosphere enhances the efficiency of the adiabatic expansion of the gaseous effluent.

39121 **APTIC NO. 62833**

Aio, Katashi

EXHAUST GAS CLEANING APPARATUS. *(Assignee not given.) Brit. Pat. 1,321,393. 7p., June 27, 1973. (Appl Dec. 29, 1971, 20 claims).*

An exhaust gas cleaning apparatus was developed for a diesel or petrol-type internal combustion engine. Other systems are based on adiabatic expansion and the exhaust gases are insufficiently cleaned, particularly after use over a prolonged period of time when non-uniform deterioration of the system of expansion chambers and filter chambers occurs. In particular, the extent of clogging of filter material in the filter chambers is non-uniform. An apparatus was developed which spreads the exhaust gas load throughout the entire apparatus by means of a conduit, rather than passing the entire exhaust gas load to a single cleaning filter. It is possible to minimize non-uniform deterioration of the cleaning stages as a result of clogging of the collecting chambers. Even if such a non-uniform deterioration should occur, the cleaning operation will be able to continue using the still functioning cleaning stages.

39122 **APTIC NO. 60198**

Alders, Lucas and Pieter Zaal

PROCESS FOR THE REMOVAL OF ACIDIC GASES FROM A GAS MIXTURE. *(Shell Oil Co., New York) U. S. Pat. 3,760,564. 4p., Sept. 25, 1973. 4 refs. (Appl. March 20, 1972, 9 claims).*

A process is described in which acidic gases such as carbon dioxide and hydrogen sulfide are selectively absorbed from gaseous mixtures with the use of a branched chain aliphatic mono-ketone. Suitable compounds include hydroxy and ether ketones. This method can be used to treat gas mixtures which contain hydrogen and/or gaseous hydrocarbons such as natural gas, synthesis gas, and the like. Unlike previous methods which were suitable only when CO2 or H2S have relatively low partial pressures, this method absorbs increasing amounts of acid gases as partial pressures increase. The absorbent is inert in respect of the components of the gas mixture to be treated, is noncorrosive, and has a high selectivity for CO2 and H2S in comparison with the absorption of hydrogen and hydrocarbons. (Author abstract modified)

39123 **APTIC NO. 62721**

Allen, Marvin

PRATT AND WHITNEY, FLORIDA, LOW COST TURBINE WHEEL MANUFACTURING DEVELOPMENT. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 133-151. (Oct. 14-19.)*

The basic United Aircraft patented process, referred to as the GATORIZING forging process, to forge impeller and turbine wheels for gas turbine engines is described. A research program to demonstrate the feasibility of this low cost production method for automotive gas turbine rotors is reviewed. The objectives of the program are to design and fabricate the dies and experimentally demonstrate the low-cost, mass-production manufacturing techniques for automotive turbine disks; to estimate the costs for a representive turbine disk for production rates of 1 million turbine disks per year; and to produce, evaluate, and deliver compressor turbine disks utilizing the recommended manufacturing process for demonstration in the EPA baseline gas turbine engine. The research program and its results are reviewed.

39124 **APTIC NO. 62137**

Allen, Walter R., Jr.

GAS QUENCHER-SCRUBBER AND WATER SEAL APPARATUS FOR HOT PARTICLE-LADEN GAS SOURCES. *(Research-Cottrell, Inc., Bridgewater Township, N. J.) U. S. Pat. 3,773,308. 10p., Nov. 20, 1973. 5 refs. (Appl June 26, 1972, 7 claims).*

In a twin foundry furnace cupola, a cylindrical, vertically oriented quencher having generally a conical floor is divided into two sections by a diametrical baffle upstanding from the floor to a point about half the height of the quencher and to the bottom of a horizontal gas outlet located in the side of the quencher, each section formed by the diametrical baffle having an inlet for gases from its associated cupola and being segmented by a vertical baffle that extends downwardly to a point adjacent to and spaced from the floor and below the top of the diametrical baffle. Each section has overhead spray nozzles to spray water onto the baffles and the gases, and each section has its own floor drain. When one cupola is shut down, its quencher drain closes, and the section is filled with water to seal off the gas passage to the cupola. Hot particle-laden gases from the functioning cupola enter its quencher section and are saturated with water. The gas is then drawn under the baffle and through the restrictive passage between the baffle and the floor, and then upwardly in turbulence to the gas outlet so that the temperature of the gas is lowered and so larger particles are removed and carried out the drain with the spray water. The scrubbed and cooled gases pass from the quencher through the outlet via conduit means to, preferably, a fine particle scrubber, a mist eliminator, and then a chimney. The particle-laden water flows to a separation tank, and then the water is recirculated. No prior art devices are capable of receiving hot, particle-laden gases from a plurality of sources and then capable of closing off one source for reconditioning of the furnace, while the source of gases is open and the gases treated. (Author abstract modified)

39125 **APTIC NO. 62233**

Archer, D. H., E. J. Vidt, D. L. Keairns, J. P. Morris, and J. L. Chen

COAL GASIFICATION FOR CLEAN POWER GENERATION. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-3-1 to III-3-30, EPA-650/2-73-053. 29 refs. (Dec.)*

NTIS: PB 231977/AS

The growing demand for electrical energy in the U. S. requires the construction of new coal-fired power plants. Coal gasification, coupled with combined gas and steam turbine generation, provides a basis for a low cost, high efficiency, nonpolluting plant. A fluidized-bed coal gasification process adapted to power generation was devised. It uses air and steam for gasification and limestone or dolomite sorbent for desulfurization. A development effort is underway which includes the construction of a 1200 lbs/hr coal gasifier and the performance of a supporting laboratory program. This research is described. Heat and material balances for the 1200 lbs/hr process development plant are presented in an appendix. (Author abstract modified)

39126 **APTIC NO. 62726**

Armstrong, Jack

ORGANIC FLUID RECIPROCATING SYSTEM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 179-184. (Oct. 14-19.)*

A program for the development of a low emission Rankine-cycle propulsion system for automobiles is described. The system uses an organic-based working fluid with a reciprocating expander. The working fluid is Fluorinol-85, a mixture of 85 mole% trifluoroethanol and 15 mole% water. The system is designed to provide performance approximately equivalent to a 351 cu in. displacement internal combustion engine in the reference car. A significant gain in fuel economy is achievable by improving the performance. Higher expander efficiency, due to improved valving, was demonstrated. The modified expander coupled with higher peak temperature and an improved boost pump schedule are expected to result in emissions of .275 g/mi nitrogen oxides, .21 g/mi carbon monoxide, and .17 g/mi unburned hydrocarbons, generally lower than the 1976 standards. Features of the advanced prototype design and its fuel economy are described.

39127 **APTIC NO. 62643**

Bahr, Donald W.

TECHNOLOGY FOR THE REDUCTION OF AIRCRAFT TURBINE ENGINE EXHAUST EMISSIONS. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 29-1-29-13. 5 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Development efforts to provide technology for the design of turbine engine combustors with reduced levels of objectionable gaseous emissions, in addition to low smoke particulate emissions, are described at the General Electric Co. Tests of both production and advanced engines have been conducted to determine the emission characteristics of aircraft turbine engines and the results of the evaluations are presented. Exploratory investigations were made to define and develop design approaches for reducing carbon monoxide, unburned hydrocarbons, and nitrogen oxides emissions levels of high performance from annular combustors with already developed low smoke emission characteristics. The emissions level reductions obtainable through the use of advanced primary combustion zone stoichiometry control methods and advanced fuel injection techniques were evaluated. Results are presented on the use of water injection techniques to suppress the formation of NOx in combustors. Reduced CO and hydrocarbons emissions levels appear to be attainable through the use of combustor design modifications which provide improved fuel atomization at idle and/or higher primary combustion zone fuel air ratios at idle. (Author summary modified)

39128 **APTIC NO. 62641**

Barrere, Marcel

MODELIZATION OF TURBOMACHINE COMBUSTORS FOR POLLUTION STUDIES *(Modelisation des foyers de turboreacteur en vue de l etude de la pollution). Text in French. North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 27-1-27-21. 37 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Theoretical problems in the design and utilization of models of turboreactor chambers for pollution studies are described. Simplified models of perfect and partial mixing, as well as piston type, tubular reactors, and evolutionary combustion models are discussed with respect to the gas phase, the biphasal flow, nitric oxide, carbon particle, and carbon monoxide formation on the droplet level. The combustion chamber is illustrated by a set of elemental combustion chambers for pollutant generation and abatement studies. The rate of NO formation at the droplet level is a function of the droplet diameter, the nature of the droplet, the pressure, temperature, and the composition of the ambient gas. Carbon formation is only possible at a sufficiently long residence time in the combustion zone of rich mixtures. It is possible to abate carbon formation by the introduction of small droplets and of pre-evaporated fuel for subsequent rapid mixing with air. Carbon monoxide is formed essentially in the combustion reactions of the fuel.

39129 **APTIC NO. 62230**

Baxter, B. J., L. H. Brooks, A. E. Hutton, M. E. Spaeth, and R. D. Zimmerman

FLUIDIZED-BED COMBUSTORS USED IN HTGR FUEL REPROCESSING. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. II-4-1 to II-4-12, EPA-650/2-73-053. 4 refs. (Dec.)*

NTIS: PB 231977/AS

Fluidized bed combustors were used in the experimental reprocessing of graphite-base fuels used in high-temperature gas-cooled nuclear reactors (HTGR). The reprocessing method is described. Exothermic fluidized bed burners and endothermic fluidized bed burners are being used. The operability, feed, heat transfer, and operation of these burners are described.

39130 **APTIC NO. 62199**

Binford, John D.

THE EFFECT OF EMISSIONS CONTROL REGULATIONS UPON INTERNAL COMBUSTION ENGINE MAINTENANCE. *Army Logistics Management Center, Texarkana, Tex., Maintainability Engineering Program, Army Material Command Intern Training Center Rept. USAMC-ITC-1-73-02, 33p., June 1973. 39 refs.*

NTIS, DDC: AD 768120

A comprehensive history of emissions regulations and discussion of their effect upon the maintenance of internal combustion engines is presented. The regulations have necessitated technological innovations, such as precision carburetor calibration, positive crankcase ventilation, air injection reactor, exhaust gas recirculation, controlled combustion system, thermal and catalytic exhaust reactors for hydrocarbons, carbon monoxide, and nitrogen oxides control. The statutes also require full use of known techniques for reducing emissions, such as decreased compression ratios, removal of quench and/or squish combustion chamber designs, and better mixture distribution through intake manifold redesign. Emission control devices provide increased maintenance to the consumer and shortened usable engine life where emissions are a controlling factor. Gasoline modification has offered a maintenance-free reduction in emissions with increased engine life and emissions control system performance. The cost to the consumer is in increased gasoline refining costs passed on in the form of higher gasoline prices. The examination of possible use of inspection/maintenance programs to maintain emissions levels has indicated the use of Idle Mode and Key Mode inspection programs as an optimal solution. Reductions in hydrocarbons and CO emissions are approximately 8% and 10% respectively. (Author conclusions modified)

39131 **APTIC NO. 62287**

Bintz, Louis J., Thomas A. Tappenden, and Roger A. Banowetz

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA. 37,000 MILE MAZDA TEST PROGRAM. *Preprint, Automobile Club of Southern California, Automotive Engineering Dept., 32p., March 20, 1973.*

A 37,000 mile road test of a 1971 Mazda RX-2 car powered by a Wankel rotary engine is discussed. Zero mileage emissions were 1 g hydrocarbons, 5.39 g carbon monoxide, and 0.82 g oxides of nitrogen per mile. After 37,651 miles, the exhaust emissions had degraded to 1.42 g HC, 8.18 g CO, and 1.11 g NOx. The average HC emissions were 1.98 g/mi. However, emissions exceeded the 1971 standard on three of the eight checks. The average CO emissions were 10.53 g/mi. During five of the eight tests, emissions remained below proposed 1975 California standards. The average NOx emissions were 0.96 g/mi. During five of the eight tests, emissions were below proposed 1975 California standards. The overall gasoline mileage was 17.5 mi/gal; the highest mileage was 21.3 mi/gal; the lowest mileage was 12.9 mi/gal. Maintenance requirements, vehicle driveability, availability of parts, engine wear, noise levels, the test program itself, results of the test car questionnaire survey, and specifications of the Mazda are discussed.

39132 **APTIC NO. 62740**

Breshears, Robert

PARTIAL HYDROGEN INJECTION INTO INTERNAL COMBUSTION ENGINES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Ofice of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 268-276. (Oct. 14-19.)*

A high-efficiency, low-emission engine development project is described. The system has the potential of meeting the 1977 emission standards with improved fuel economy compared with uncontrolled engines. It uses current fuels and is low in cost. The concept is to use small amounts of hydrogen to allow burning of gasoline under ultra-lean conditions. Hydrogen is generated aboard the vehicle by feeding gasoline, water, and air to a hydrogen generator which produces H2 and carbon monoxide. The generated gas is mixed with gasoline and fed to a conventional engine. The required hydrogen is produced in the generator and no H2 is stored aboard the vehicle. A CFR engine was operated down to equivalence ratios of 0.1 where nitrogen oxide emissions are less than 1/100 of the emission standard, in fact, down to the ambient air standard of 0.25 ppm. Mixtures of hydrogen and gasoline in CFR and V-8 engines showed very low NOx emissions in the ultra-lean region, CO emissions below the 1977 standards as long as adequate quantities of H2 were used to avoid misfire, and hydrocarbons above the 1977 standards. Future work needed, the hydrogen generator, and status of the system are described.

39133 **APTIC NO. 61024**

Caldwell, Roland Blair

INTERNAL COMBUSTION ENGINE EXHAUST RECIRCULATION SYSTEM. *(Abgasrueckfuehreinrichtung fuer eine Brennkraftmaschine). Text in German. (Ranco Inc., Columbus, Ohio) W. Ger. Pat. Appl. 2,221,152. 12p., Feb. 22, 1973. 7 refs. (15 claims).*

A exhaust gas recirculation system for internal combustion engines is described. The system incorporates a valve in the return pipe between the exhaust manifold and the air inlet manifold which is operated by the pressure in the latter manifold. A regulator in the pipe connects the inlet manifold to the valve actuator. When the engine is running normally, this boosts inlet manifold pressure on the actuator, but when on full load or running at high speed it allows this pressure to affect the acutator without interference. A stop valve located between the regulator and the inlet manifold in the return pipe keeps the valve open during instantaneous complete opening and subsequent closing of the throttle. With the throttle wide open, the regulator is connected with the inlet manifold and bypasses the stop valve through a pressure release valve. A vacuum tank is inserted between the stop valve and the regulator.

39134 **APTIC NO. 62402**

Chakravarty, Shubhra and H. K. Muchandani

DEPOLLUTION TECHNIQUES AND MANAGEMENT IN AN OIL REFINERY. *Chem. Age India, 24(12):819-826, 1973. 6 refs.*

The high demand for petroleum products and the consequent increase in the refining capacity in India in the coming years are bound to spotlight the associated pollution problem. The three components of refinery pollution are discussed: waste water, air pollution, and noise pollution. Basic design considerations, control philosophies, and clean air and effluent standards are discussed. The main air pollutants are hydrocarbons, sulfur dioxide, aerosols, carbon monoxide, and odors. Control techniques are described for waste water, air, and noise pollution. Air pollution control techniques include desulfurizing oil, burning natural gas, properly designed storage tanks, smokeless flares, correct stack height, scrubbers, fume incinerators, the Claus process, and flue gas desulfurization.

39135 **APTIC NO. 62258**

Chalmers, Frank S., Louis Korosy, and A. Saleem

THE CITRATE PROCESS TO CONVERT SO2 TO ELEMENTAL SULFUR. *Preprint, Purdue Univ., West Lafayette, Ind., 7p., 1973. (Presented at the Industrial Fuel Conference, West Lafayette, Ind., Oct. 3-4, 1973.)*

Three companies working on removal of sulfur dioxide from flue gas by a citrate process joined together to study 35 different SO2 removal methods. Advantages and disadvantages are presented of direct oxidation, absorption/stripping, direct reduction, lime wet scrubbing, and limestone wet scrubbing methods. Although these methods warranted further investigation, none were proven for use on dilute SO2 gases. The citrate process seems to meet ideal process characteristics of selective SO2 removal, production of sulfur as a by-product, and minimum costs. A feasibility study of the citrate process is described including the method, process reactions, and preliminary economics. Capital costs for a battery limits unit retrofitted to a 200 MW coal-fired boiler are shown, which work out to $31/KW. A similar limestone process would cost $45/KW. Operating costs are 1.3 mils/KWH for the citrate process compared to 2.1 mills/KWH for the limestone scrubbing.

39136 **APTIC NO. 62231**

Cole, W. E. and R. H. Essenhigh

STUDIES ON THE COMBUSTION OF NATURAL GAS IN A FLUID BED. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. II-5-1 to II-5-25, EPA-650/2-73-053. 8 refs. (Dec.)*

NTIS: PB 231977/AS

Natural gas was burned in a fluid bed of 1.4 sq ft cross-sectional area, using expanded alumina of 14-16 mesh. The gas/air mixture was supplied premixed. Initial problems of operation, now solved, concerned rapid ignition and uniform distribution. Light-off initially required 2 hr or more before combustion was uniform throughout the fluid bed. This period is now consistently 5-10 min. With very uniform gas distribution, obtained with a distributor of novel design, fluid bed depths were reduced from 6 to 1 in. for complete combustion, even up to superficial (hot) flow velocities of 12 ft/sec. Combustion intensities at 2000 F and 100% excess air were in the region of 10 to the 6th power Btu/cu ft/hr based upon bed volume. Experiments were carried out with excess air ranging from 60 to 150%, with extinction at the higher value. Gas rates ranged from 6 to 11 cu ft/min. Bed temperatures ranged from 1700 to 2400 F, rising with fuel/air ratio. Air rich extinction boundaries were mapped over a range of fuel/air ratios. Bed temperatures, gas analysis, and pressure drop on a vertical axis through the bed were also measured. Superadiabatic temperatures and a lowering of the lean flammability limit were observed. These two observations were explained qualitatively by the pre-heat effect of the fluid bed particles. Reaction rates were significantly faster than for free-burning gas in a premixed flame at comparable temperatures and gas concentrations. The effect was attributed to the bed particles. Data on the physical behavior of the bed, with good theoretical agreements, are given. (Author abstract)

39137 **APTIC NO. 62239**

Copeland, G. G.

DISPOSAL OF SOLID WASTES BY FLUIDIZED-BED COMBUSTION. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed. Combust., 3rd, 1973, p. II-2-1 to II-2-10, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

The principles of solid waste incineration in a fluidized bed, typical applications of fluidized bed incinerators, the use of fluidized bed incinerators for pollution control, and the world s largest fluidized bed system for burning bark, debris, and sludge are discussed. The largest fluidized bed incinerator was able to accept large numbers of stones up to 6-inch in diameter, non-magnetic scrap metal, cans, and a variety of other things. It can fluidize bed rock particles up to 1-inch cubes and still maintain good bed stability. The unit has never produced smoke; air pollution control is so good that pressure drop across the double scrubbing system has been reduced from 50 in. water to 15-20 in. water, while still meeting the very stringent air pollution regulations of the Province of Ontario. The ability of the unit to dispose of large pieces of solid waste has encouraged Great Lakes Paper to institute a change of feed flow which will eliminate the hog completely. When completed, all waste, including waste pulp wood sticks up to 4 ft long will be fed directly into the bed without any size breakdown. (Author summary modified)

39138 **APTIC NO. 61965**

Cornell, Conrad F.

LIQUID SOLID SEPARATION. *Probl. Beyond Removal, Proc, Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 181-207. (Oct. 31.)*

Liquid-solid separation of sludge from sulfur dioxide scrubbers is reviewed. Costs are the most important factor in determining which separation method to choose -- thickeners, screens, classifiers, cyclones, filters, centrifuges, or dryers. Thickeners are the cheapest process. The operation and choice of these methods are reviewed. The costs and methods of operation of various types of thickeners and filters are reviewed in detail.

39139 **APTIC NO. 57516**

Craig, Alfred B.

EPA LOOKS TO THE FUTURE OF BAG FILTRATION (FINE PARTICULATES AND NEW SOURCE PERFORMANCE STANDARDS). *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1973. (Presented at the Air Pollution Control Association, Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., 1973.)*

The Clean Air Act of 1970 included authority to promulgate national emission standards for new sources and for existing sources of pollution. On April 30, 1971, the Environmental Protection Agency promulgated National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide. Particulate matter is the only one of the six original criteria pollutants currently controlled by fabric filtration. Gross particulate emissions in the U. S. totaled 18 million tons/yr in 1971. More than 95% of the particles were measured using sampling and sizing procedures that were not suitable for the particle size range below 2 micron. Therefore it was necessary to extrapolate data for the 0.1-2 micron range. Based on this type of extrapolation, fine particulate emission data from major industrial sources were estimated. The major industrial particulate sources are ferro-alloy furnaces, steel-making furnaces, coal-fired power plants, lime kilns, kraft pulp mill recovery furnaces, municipal incinerators, iron foundry cupolas, crushed stone plants, hot-mix asphalt plants, and cement kilns. Several studies have been made on inertial impactors, diffusion batteries coupled with condensation nuclei counters, and a Climet particle size analyzer to measure particles below 2 micron. The baghouse has greater than 99% efficiency in the particle size range below 2 micron. The high efficiency electrostatic precipitator is more effective on fly ash in the fine particulate range than anticipated. The range of applicability of both baghouses and precipitators to control fine particulates is limited to certain conditions. New source performance standards have been set for fossil fuel-fired steam generators of more than 250 million Btu/hr input; incinerators processing more than 50 tons/day of municipal waste; Portland cement plants; nitric acid plants; and sulfuric acid plants. Guidelines have been developed to set standards for a wide variety of source categories. The EPA is studying the sources of particulates and control methods.

39140 **APTIC NO. 62244**

Craig, J. W. T., G. Moss, J. H. Taylor, and D. S. Tisdall

SULFUR RETENTION IN FLUIDISED BEDS OF LIME UNDER REDUCING CONDITIONS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-4-' to III-4-14, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

A test program on a batch basis was carried out on an oil-fired fluidized bed gasifier using lime to remove sulfur from fuel oil. A 7 by 10 to the 6th power BTU/hr continuously regenerating gasifier was constructed and successfully operated. The gasifier will operate satisfactorily at lower stoichiometric ratios and at higher temperatures than were previously established. During the fresh bed and cyclic batch tests, sulfur dioxide, oxygen, carbon monoxide, and carbon dioxide emissions were measured. Desulfurizing efficiency decreased as the air/fuel ratio decreased, and efficiency increased when the operating temperature decreased between 840 and 870 C to 800 C. Carbon monoxide and dioxide formation depended on temperature and the availability of carbon content in the bed material. Limestone particle size also affected desulfurizing efficiency in the cyclic test. Operating conditions for the continuous gasifier tests are reviewed. The sulfur removal efficiency was 95-100% in the continuous gasifier tests.

39141 **APTIC NO. 62245**

Curran, G. P. and E. Gorin

THE CO2 ACCEPTOR GASIFICATION PROCESS-A STATUS REPORT--APPLICATION TO BITUMINOUS COAL. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-5-1 to III-5-16, EPA-650/2-73-053. 8 refs. (Dec.)*

NTIS: PB 231977/AS

Experience gained and problems encountered during startup operations of a carbon dioxide acceptor gasification pilot plant are discussed. A project schedule is given for completion of that phase of the work aimed at production of pipeline gas from low-rank western coals. Process revisions that must be made in application of the CO2 acceptor system to high-sulfur bituminous coals are discussed. The major revisions are installation of pretreatment facilities to handle caking coals and an increase in gasification temperature to accommodate the poorer reaction kinetics. Experimental work on the pretreatment of bituminous coals to render them suitable for pressurized gasification by preoxidation is being carried out. Highly fluid coals such as Pittsburgh seam coal, however, require economically excessive amounts of preoxidation. Promising results are reported via a Seeded Coal type process. A revised flow sheet and heat and material balance is given for the application of the CO2 acceptor process to the processing of bituminous coals. Recycle of CO2 is a key feature in this operation. Half of the sulfur is eliminated as hydrogen sulfide in the pretreater, the remaining sulfur is largely retained and discarded in the spent acceptor as calcium sulfide. It will also be recovered as H2S. All H2S can be recovered for sale or use. The sulfur content in the regenerator off gases is low enough so that it may be flared without scrubbing; but prior incineration of residual reduced sulfur forms to sulfur dioxide is required. (Author abstract modified)

39142 **APTIC NO. 62246**

Curran, G. P., B. Pasek, M. Pell, and E. Gorin

LOW-SULFUR PRODUCER GAS VIA AN IMPROVED FLUID-BED GASIFICATION PROCESS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-6-1 to III-6-17, EPA-650/2-73-053. 11 refs. (Dec.)*

NTIS: PB 231977/AS

The evolution of the process concepts for generation of clean low-BTU gas from bituminous coals via fluidized bed gasification is described. The improved process now being developed does not involve the carbon dioxide acceptor principle. Hot sulfur (as hydrogen sulfide) recovery from the gas is achieved by the use of dolomite. The residual char from the gasifier is utilized in a carbon burn-up cell. The heat sink utilized in this case is the sensible heat of the air and steam feed to the gasifier. Dolomites show activity for hot sulfur cleanup via the reaction, calcium carbonate + hydrogen sulfide equals calcium sulfide + water + CO2. A single limestone was tested and was substantially inactive. Various dolomites were assessed, and the best results were obtained with pure crystalline type stones. Experimental background data around other key process steps are also briefly presented. (Author abstract modified)

39143 **APTIC NO. 61737**

Day, Edward George, Ernst Ludwig Ranft, and David Charles Hill

INTERNAL COMBUSTION ENGINE EXHAUST GAS RECIRCULATION SYSTEM. *(General Motors Corp., Detroit, Mich.) Brit. Pat. 1,333,506, 7p., Oct. 10, 1973. (Appl. Nov. 4, 1971, 6 claims).*

An internal combustion engine exhaust gas recirculation system is described in which recirculation of exhaust gases is controlled by a valve assembly responsive to induction passage pressure sensed adjacent a throttle valve. The assembly is responsive to induction vacuum signals which are produced at an elongated slot in the induction passage adjacent to a throttle valve movable from a closed to an open position. The elongated slot is disposed in the induction passage relative to the throttle valve so as to be exposed simultaneously to the pressures induced in the passage upstream and downstream of the throttle valve. The resultant vacuum signal conveyed to the pressure responsive valve assembly during operation of the engine varies between a first value when the throttle valve is at its open position, a maximum value when the throttle valve is between its open and closed position, and a second value when the throttle valve is at its closed position.

39144 **APTIC NO. 61742**

Day, Edward George, Ernst Ludwig Ranft, and David Charles Hill

EXHAUST GAS RECIRCULATION CONTROL VALVE ASSEMBLY FOR AN INTERNAL COMBUSTION ENGINE. *(General Motors Corp., Detroit, Mich.) Brit. Pat. 1,333,507. 6p., Oct. 10, 1973. (Appl. Nov. 4, 1971, 5 claims).*

An exhaust gas recirculation control valve assembly for an internal combustion engine is described. The valve is used in internal combustion engine exhaust gas recirculation systems in which a portion of the exhaust gases generated during operation of the engine are recirculated back through the engine induction passages to the combustion chambers to reduce the formation of nitrogen oxides and the consequent emission of these oxides in the engine exhaust gases. In the exhaust gas recirculation system, pressure signals obtained in the engine induction passage are used to govern the operation of an exhaust gas recirculation control valve assembly situated in a recirculation passage connecting the exhaust passage of the engine to the engine induction passage.

39145 **APTIC NO. 62725**

Demler, Roger

WATER BASE RECIPROCATING SYSTEM STATUS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 171-179. (Oct. 14-19.)*

The feasibility of a water-base Rankine automotive power plant with a reciprocating expander was studied. The system features, program status, and fuel economy are described. As vehicle speed increased above 30 mph, fuel economy decreased. Cold-start Federal Driving Cycle emissions were 0.18 g/mi nitrogen oxides, 0.43 g/mi carbon monoxide, and 0.18 g/mi unburned hydrocarbons compared with 1976 emission standards of 0.40, 3.40, and 0.41 g/mi, respectively.

39146 **APTIC NO. 61722**

Deschamps, Andre, Claude Dezael, and Phillippe Renault

PROCESS FOR CONVERTING HYDROGEN SULPHIDE AND SULPHUR DIOXIDE TO ELEMENTAL SULPHUR. *(Inst. Francais du Petrole des Carburants et Lubrifiants, Rueil-Malmaison (France)) Brit. Pat. 1,331,540. 5p., Sept. 26, 1973. (Appl. Nov. 25, 1971, 11 claims).*

A process for converting hydrogen sulfide and sulfur dioxide to elemental sulfur is described which uses an improved, active, stable catalyst. Hydrogen sulfide reacts with SO2 in contact with a liquid phase, a major proportion of which consists of a compound of the general formula R--OH, in which R is an aliphatic C8-40 hydrocarbon radical, optionally substituted with from 1-3 hydroxy groups, or a radical of the formula R1--(O--R2)n-- in which R1 is a hydrogen atom or a monovalent aliphatic C1-20 hydrocarbon radical, R2 is a divalent aliphatic C2-40 hydrocarbon radical, and n is an integer from 1-20. The process is carried out in the presence of a catalyst consisting of a salt formed between a metal from Group I-A or Group II-A and an ester derived from a polycarboxylic acid and a compound of formula R-OH, where R is as defined above. This catalyst avoids the frequent regenerations necessary with prior art processes.

39147 **APTIC NO. 62249**

Dickey, B. [illegible] and J. A. Buckham

APPLICATION TO COMBINED CYCLE POWER PRODUCTION OF FLUID-BED TECHNOLOGY USED IN NUCLEAR FUEL REPROCESSING. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-3-1 to IV-3-20, EPA-650/2-73-053. 5 refs. (Dec.)*

NTIS: PB 231977/AS

Fluidized bed processing is used in the recovery of uranium from spent fuel elements. Fluidized bed denitration of uranyl nitrate solutions and fluidized bed solidification of radioactive waste solutions are used routinely in plant operations. In addition, current pilot plant development of processes for recovering uranium from graphite-based fuels depends largely on fluidized bed combustion. During the course of fluidized bed operations and development for the recovery of uranium, advantageous applications of fluidized bed technology in areas other than nuclear fuel reprocessing became apparent. Current and near-term fluidized bed technology appears to be directly applicable to the conversion of the energy in wood wastes and municipal refuse to electric power. Fluidized bed operations and process development and a concept for combined cycle power production based largely on fluidized bed combustion are discussed. The fluidized bed process can be used in power generation having a thermal efficiency greater than 35% while reducing the off gas mass flow rates per MW-hr of electrical energy by a factor of eight when compared with a conventional gas turbine cycle. The steam would be generated within an in-bed heat exchanger and used as the working fluid in a steam-turbine cycle. The latest technology in finned-tube heat transfer within fluid beds would be used. The burner waste gases would be cleaned of particulate by passage through a high efficiency cleanup system consisting of staged cyclones and sintered metal or ceramic candle filters. Particulate removal at the temperature (1400-1500 F) proposed for refuse and wood waste combustion was tested in development and operations facilities in the atomic energy field. Use of existing technology and commercially available equipment where applicable will significantly reduce the development costs and time required to place a full-scale waste disposal-power generation facility on stream. Power production costs are estimated to be in the range of 5 to 6 mills/kWhr. (Author conclusions modified)

39148 **APTIC NO. 62734**

Donald, George

DIESEL ENGINES FOR LOW POLLUTION FROM AUTOMOBILES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 228-232. (Oct. 14-19.)*

The relative pollution levels produced by diesel engines in Great Britain were compared with those from gasoline and gas turbine power units. The diesel was a low pollution engine, but there are many areas in which improvements can be made in all three types of engine. Combined hydrocarbon and nitrogen oxide emission levels on typical British direct injection diesels met 1973 requirements. Improvements can be made in turbocharging, intercooling, retarded fuel injection timing, increased rate of fuel injection, reduced nozzle sac volume, pilot injection, water injection, and exhaust gas recirculation. Certain indirect injection engines have combined HC + NOx levels relatively close to the 5 g/bhp/hr level required by the 1975 Federal standard. Changes to direct injection engines may increase fuel consumption while decreasing emissions. The British direct injection engine carbon monoxide emissions are only a small fraction of the 1975 level. Legislation has been passed to limit diesel smoke, but because of low CO and HC emissions and the relative unimportance of NOx under British conditions, no legislation exists or is envisaged for the near future which would control these emissions in Britain. The diesel engine achieves a thermal efficiency of 38% or better compared with thermal efficiency to 27.5-10.5% less for a gasoline engine.

39149 **APTIC NO. 62733**

Downs, Diarmuid

DIESEL ENGINES FOR LOW POLLUTION FROM AUTOMOBILES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 223-228. (Oct. 14-19.)*

The history and use of diesel engines are reviewed. Diesel engines are now being considered for American automobiles because of their advantages in energy conservation and low pollution. Under motorway operating conditions fuel savings may be no more than 5%, on mixed driving it is generally about 30%, and in city taxi service it can approach 50%. Tests of European diesel-powered automobiles using 1975 U. S. Federal Test Procedures gave 1/6 g/mi carbon monoxide and 1.2 g/mi nitrogen oxide emissions. The best hydrocarbon emission recorded was 0.17 g/mi. These figures are below the 1976 standards and would probably satisfy the 1977 standards as well. It may be possible to change the combustion chamber design slightly or to retard spark timing to reduce NOx emissions further. A heavier diesel car might be required for America which would increase emissions to 0.19 g/mi HC, 1.8 g/mi CO, and 1.4 g/mi NOx, for a car weighing 2800 lbs and having a 65 hp engine.

39150 **APTIC NO. 62250**

Dravid, A. N., C. J. Kuhre, and J. A. Sykes, Jr.

POWER GENERATION USING THE SHELL GASIFICATION PROCESS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-4-1 to IV-4-14, EPA-650/2-73-053. 3 refs. (Dec.)*

NTIS: PB 231977/AS

Through its ability to convert liquid fuels into partially oxidized gaseous fuels and to recover the heat of partial oxidation in the form of high pressure steam, the Shell Gasification Process (SGP), aided by the Shell Sulfinol or ADIP Process, offers an attractve means of converting sulfur-laden heavy hydrocarbon feedstocks with high metal content into nonpolluting fuel gas and saleable elemental sulfur. Conceptual design and economics of an SGP-based power plant using the Combined Gas and Steam (COGAS) cycle are presented. This type of power plant offers simplicity, flexibility, and reliability, and can generate electric power at unit costs competitive with those of future conventional power plants. The chemical reactions, thermodynamics, and plant flow of the system are described. A case study is discussed. This process eliminates nitrogen oxide and sulfur emissions and recovers sulfur as a salable by-product. Effluents are minimized, and efficient heat recovery ensures very little heat loss. (Author abstract modified)

39151 **APTIC NO. 61783**

Efendiev, T. B. and V. R. Kotler

SOME METHODS OF DECREASING NITROGEN OXIDE CONCENTRATION IN FLUE GASES OF THERMAL POWER STATIONS. *Thermal Eng. (English translation from Russian of: Teploenergetika), 20(5):56-58, May 1973. 8 refs.*

Some methods of decreasing the nitrogen oxide concentration in flue gases of thermal power stations are outlined. The effectiveness of recirculating flue gases was checked on TGMP-114 boilers during combustion of oil. Recirculation of 23% of gases into the lower part of the furnace at an operational excess air of 1.02 and rated load lowered the concentration of nitrogen oxides by nearly 30%. The concentration of nitrogen NOx is approximately halved with a decrease in the load to about 60%. Forced combustion of Kansk-Achinesk coals with increase of temperature in the core of combustion by 250 C as compared with a shaft mill furnace does not lead to an increase in concentration of NOx in the case of using a furnace with opposite firing tilted burners since the aerodynamics of this furnace promotes removal of some part of the secondary air from the root of the fuel spray. (Author summary modified)

39152 **APTIC NO. 62838**

SCRUBBER SURVEY: SOME BEWILDERMENT. *Elec. World, 180(10):41-47, Nov. 15, 1973.*

The Environmental Protection Agency has cited several utility companies for violations of sulfur-emission ceilings established under the 1970 Clean Air Act. The Agency feels that stack gas scrubbing is a feasible desulfurization technique and that utilities could solve their emission problems with this method. But industry and thye Edison Electric Institute say that none of the systems under development meet the stringent U. S. emission standards. U. S. scrubbers were surveyed to determine the facts. This data is presented, exclusive of pilot plants. The survey encountered difficulty in obtaining accurate data, since some planned units never pass the engineering study stage. Pilot studies, vertical scrubbers, and horizontal scrubbers are mentioned.

39153 **APTIC NO. 62247**

Elliott, D. E. and M. J. Virr

SMALL-SCALE APPLICATIONS OF FLUIDIZED-BED COMBUSTION AND HEAT TRANSFER. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-1-1 to IV-1-14, EPA-650/2-73-053. 5 refs. (Dec.)*

NTIS: PB 231977/AS

State-of-the-art on small-scale applications of fluidized bed combustion and heat transfer and data on combustion and heat transfer are reviewed. Domestic fluidized bed combustion/heat transfer systems have been developed which are no more expensive, just as compact, and have far less pollution than their conventional counterparts. Endurance and reliability trials are in progress so that by 1972, the full potential of gas-fired fluidized bed combustion can be assessed as applied to small-scale boilers. Additional work should be undertaken on oil- and coal-fired systems. Fluidized beds and heat transfer can be used in metallurgical heat treatment processes in which the antipollution aspects combined with rapid processing lead to environmental and economic benefits. Batch processing furnaces are now available, and in-line continuous furnaces show promise. The development of shallow bed, extended surface heat transfer systems promises to open up a completely new field in heat recovery and could help to reduce costs and space requirements in many types of plants. Thus, fluidized beds and heat transfer can be used for antipollution measures over the whole range for units having an output of a bunsen burner up to extremely large power station sizes; in many cases it will be accompanied by economic benefits. (Author conclusions modified)

39154 **APTIC NO. 61909**

Eremit, Lothar

THE TASKS OF THE CHEMICAL INDUSTRY IN SHAPING THE NATURAL ENVIRONMENT. *(Die Aufgaben der chemischen Industrie bei der Gestaltung der natuerlichen Umwelt). Text in German. Chem. Technol., 25(11):645-648, Nov. 1973. 90 refs.*

The chemical industry emits primarily the following pollutants: sulfur dioxide, hydrogen sulfide, carbon disulfide, nitrogen oxides, hydrocarbons, halides, hydrogen halides, carbon monoxide, organic compounds, and dusts. The two main pollutants dust and sulfur dioxide stem from power production within the chemical industry. The problem of dust collection has been solved through installation of efficient electrostatic precipitators. The removal of sulfur dioxide is still an unsolved problem the world over. To data about 30 flue gas desulfurization processes have been tested in pilot and scaled down plants. The dry processes seem to be better than the wet processes. For removal of gaseous pollutants from emissions by the chemical industry primarily absorption and adsorption processes are applied. A brief discussion of these two methods along with a brief review of catalytic afterburning is given.

39155 **APTIC NO. 61966**

Faber, John H.

A NEW DIMENSION IN ASH HANDLING DUE TO ENVIRONMENTAL SYSTEMS. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 211-218. (Oct. 31.)*

Proposed new emission control standards for the electric utility industry will dramatically effect present day ash handling systems and disposal methods. Disposal costs could increase to $2/ton of coal burned. New ashes will differ physically and chemically from present materials and will be used in new products. Various treatment methods are described, for ashes including bottom ash, fly ash (dry and wet), and new products. Ash uses include cement and road base construction.

39156 **APTIC NO. 62619**

Ferri, Antonio

REDUCTION OF NO FORMATIONS BY PREMIXING. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. A-1-A-9. 1 ref. (April 9-13.)*

NTIS, DDC: AD-769 278

A combustion process involving flame premixing is described which reduces nitric oxide formation and can be used with future supersonic transports (SST). Combustor designs capable of producing gases in the 1200 to 1800 K range are practical for future SST engines at cruise speeds. The only requirement for the combustor at cruise level is to produce the chemical reaction in air fuel mixtures, with an average value of the composition 0.3 to 0.5 of stoichiometric. The high temperatures corresponding to stoichiometric mixtures can be avoided provided that the combustion can be generated and sustained in the stream. The fuel and air must be premixed before combustion, and the stoichiometric fuel to air ratio in the mixture must be uniform and below stoichiometric, and a sufficient amount of fuel must be present so that the flame can be sustained. If the mixture is ignited at one point, the heat release due to reaction is sufficiently high to generate a stable flame that propagates to all the mixture. Because the flame is a heat conduction flame, in a uniformly premixed mixture, the maximum local temperature is determined by initial temperatures and by the local fuel to air ratio. Because the mixture is below stoichiometric, the maximum temperature reached locally is lower than in a diffusion type flame. For cruise conditions corresponding to the engines required for the SST, the NO concentration can be reduced by two orders of magnitude with respect to present engines using the present knowledge of rate of combustion processes.

39157 **APTIC NO. 61954**

Fuller, William Robert, Barrie Hill Bieler, and David Cecil Morgan

METHOD OF REDUCING HALIDE EMISSIONS FROM THE INCINERATION OF HALOGEN-CONTAINING PLASTICS. *(Dow Chemical Co., Midland, Mich.) Brit. Pat. 1,325,460. 4p., Aug. 1, 1973. (Appl. Oct. 2, 1970, 10 claims).*

A method of reducing halide emissions from the incineration of halogen containing plastics is described. The emissions can be substantially reduced by adding to the polymer a mineral alkali or alkali precursor before it is incinerated. It can be added to the waste in the form of an aqueous dispersion or of a particulate solid or powder. The suitable alkalis include hydroxides, oxides, carbonates, carboxylates, xanthates, sulfites, and hydrosulfites of the alkali and alkaline earth metals. Particularly good results can be obtained if a cellulosic waste (as paper) is also added and mixed with the halogen containing organic polymer waste before it is incinerated. The waste is preferably reduced to shredded or particulate form before it is incinerated. Advantageously the alkali or alkali-percursor is added to the shredded or particulate waste in an amount to provide 0.4 to 1 mole of alkali for each mole of halogen emission generated by the burning of the waste.

39158 **APTIC NO. 60124**

Furukawa, Shunji, Koichiro Kanefuji, Shigeru Masumoto, Nobuo Masuda, and Isamu Noguchi

ON CALORIC GAS SELF-CIRCULATING BURNER AS A LOW NOX BURNER. *(Tei NOx bana to shiteno jiko netsu gasu saijunkan bana ni tsuite). Text in Japanese. Preprint, Japan Society for Safety Engineering, Tokyo, p. 85-87, 1973. 1 ref. (Presented at the Safety Engineering Studies Presentation Meeting, 6th, Tokyo, Japan, Dec. 6-7, 1973, Paper 24.)*

A caloric gas burner designed to reduce nitrogen oxides emissions recirculates the combustion gases within the combustion area without lowering the temperature. The combustion air sent into the precombustion chamber lowers the pressure within the combustion gases in the main combustion chamber are forced into the first chamber. The fuel is diluted with the circulating gas and local high temperatures are avoided. Even a liquid fuel is gasified completely by the high temperature in the precombustion chamber. The burner reduces nitric oxide emissions by a third and the NO emissions are higher with higher furnace temperatures.

39159 **APTIC NO. 62834**

Gast, Richard Albert and Harry Ream Mitchell

EXHAUST EMISSION CONTROL SYSTEMS ON INTERNAL COMBUSTION ENGINES. *(General Motors Corp., Detroit, Mich.) Brit. Pat. 1,321,177. 12p., June 20, 1973. (Appl. Oct. 21, 1971, 13 claims).*

The development of exhaust control systems on multi-cylinder internal combustion engines is described in which the air is mixed with the exhaust gases leaving the engine in order to reduce the unburned hydrocarbons. No other air injection system delivers the air to the stream of hot exhaust gases as they are emitted from the engine combustion changers directly adjacent to the exhaust valves. Other systems are not adequate to induce sufficient flow of air into the exhaust system to reduce the amount of unburned constituents in the exhaust gases to meet present emission control standards. In this system exhaust system pressure pulsations are used to induce sufficient air flow to support additional oxidizing or burning of the exhaust gases in the engine exhaust passages and thereby reduce the amount of unburned constituents.

39160 **APTIC NO. 61037**

Gloeckler, Otto, Dieter Eichler, Willi Gansert, Peter Schuelzke, Erich Singer, Wolfgang Soell, and Hermann Eisele

MIXTURE-COMPRESSING FUEL-INJECTION ENGINE CONTROL SYSTEM WITH EXHAUST GAS RECIRCULATION. *(Steuereinrichtung zum Betrieb einer gemischverdichtenden, mit Abgasrueckfuehrung arbeitenden Einspritzbrennkraftmaschine). Text in German. (Robert Bosch GmbH, Stuttgart (West Germany)) W. Ger. Pat. Appl. 2,143,435. 10p., March 15, 1973. 8 refs. (10 claims).*

Control system for exhaust gas recirculation in mixture-compressing fuel-injection engines is described. The return pipe discharges into the intake upstream of the throttle butterfly, and is controlled by a solenoid-operated stop valve actuated by throttle-operated switches. The switches keep it shut when idling or near full load and fully open under partial load conditions. Both switches are connected to a tipping stage input. This stage incorporates a tipping transistor, and a time lag element for a delay of at least 0.1 sec.

39161 **APTIC NO. 62599**

Glueck, A. R.

MOLTEN SALT PROCESSES FOR SULFUR EMISSION CONTROL. *Chem. Eng. Progr., 69(3):56-57, March 1973. 7 refs.*

The application of molten salt processes for sulfur emission control from coal-burning operations is reviewed. Using ionic melts, contact between the melt and reactants can be effected with a moving bed or a fluidized bed reactor. Salts may also be metered or pumped by magnetohydrodynamic methods and may be maintained in the fluid state by resistance heating. Two molten salt desulfurization processes are reviewed: a precombustion desulfurization of coal similar to a molten salt analogy of solvent extraction and a process for the indirect oxidation of coal with attendant production of steam.

39162 **APTIC NO. 62235**

Godel, A. A.

SELECTIVE EXTRACTION OF CLINKER AT THE BOTTOM OF A DEEP SELF-AGGLOMERATING FLUIDIZED BED. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. I-5-1 to I-5-10, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

Agglomerating fluidized beds can be used for coal combustion. Self-agglomeration in a heavily turbulent fluidized bed results from preferential bonding of slag particles when they reach their sintering temperature. But when slag particles encounter coal particles, there is little chance for agglomeration. Slag agglomerates can form, however, in a state of quasi-purity. They fall to the bottom of the bed when they acquire sufficient weight and must be eliminated promptly to avoid blocking fluidization. Ash can be extracted by slag agglomeration which permits the dust to be reinjected. A new process for extracting the slag at the base of a deep fluidized bed was developed. The process may be adapted for beds for fuel gasification in conjunction with appropriate complementary treatments such as desulfurization and catalytic reactions. The process has been tested successfully in experiments on 1:20 scale models and will soon be tested in a pilot plant.

39163 **APTIC NO. 62653**

Gompf, Henry

EVALUATION OF THE NEW YORK STATE DUAL-CATALYST VEHICLE. *Environmental Protection Agency, Washington, D. C., Emission Control Technology Div., Rept. 74-17 HLG, 7p., Nov. 1973.*

The evaluation of the New York state dual catalyst system which employs Gould reduction catalysts for control of nitrogen oxides and Engelhard oxidation catalysts for control of hydrocarbon and carbon monoxide is described. A total of five emission tests were conducted on a 1972 American Motors Matador equipped with a 304 CID eight cylinder engine and an automatic transmission. At low system mileage the vehicle met the 1976 statutory levels. Excluding tests which were characterized by cold starting problems, after 25,000 mi the system is still operating near the 1976 statutory levels. Fuel economy measured was 11% poorer than for a comparable 1973 AMC vehicle, but only 3% poorer than for a comparable 1974 AMC vehicle. The test vehicle was a converted 1972 AMC vehicle, but no fuel economy data for a comparable unmodified 1972 AMC vehicle are available. (Author conclusions modified)

39164 **APTIC NO. 61641**

Greeley, Richard S.

STATUS OF STACK GAS SULFUR DIOXIDE CONTROL. *Mitre Corp., Washington Operations, M73-4, 10p., Jan. 1973.*

The status of stack gas sulfur dioxide control and problems associated with the processes are discussed. The Environmental Protection Agency has taken the position that control processes have been adequately demonstrated for industrial use to meet air pollution regulations. In the U. S., two 100 megawatt furnaces and one megawatt furnace have been fitted with limestone scrubbing systems and SO2 removal demonstrated in short tests. However, the equipment is not reliable and the cost appears to be about $40 or more per kilowatt installed in a new plant, and may be higher for a retrofit. Operating costs are expected to run from $2-4/ton of coal. Another problem is waste, the limestone wet scrubber produces 4 lb of waste/lb of sulfur removed. The project operating costs may reach well over 2 mills/kilowatt hr. Units for 20 power plants are on order as of the end of 1972 at a total cost of about $200 million. A total of 4700 megawatts of utility production will be covered. However, this is only 1.8% of the total output of fossil-fired power units in the U. S.

39165 **APTIC NO. 62121**

Grupinski, Leonhard

DETERMINATION OF CONCENTRATIONS OF ORGANIC COMPOUNDS BY INFRARED SPECTROMETRY IN WASTE AIR AHEAD OF AND BEHIND WASTE AIR CLEANING SYSTEMS. *(Konzentrationsbestimmungen organischer Verbindungen mit Infrarotspektrometrie in der Abluft vor und nach Abluftreinigungsanlagen). Text in German. Wasser Luft Betrieb, 17(12):434-438, 1973. 4 refs.*

Branches of waste gas flows ahead of and behind waste gas cleaning systems were drawn off at a speed of 1/min and passed over fritted gas scrubbers. As absorbent in the gas scrubbers, ethylene perchloride was used. Samples of the cleaned and uncleaned gas were taken simultaneously. The analyses were performed with water scrubbers, one adsorber (activated coal), one wet electrostatic precipitator, and thermal and catalytic afterburners. As expected, scrubbers operated with clean water had an unsatisfactory cleaning efficiency for organic substances. In the particular case of a water scrubber which was supposed to clean gasoline, oil, and resins from the waste air from a drier of an offset printing machine, a cleaning efficiency of only 20% was achieved. All results are listed in ten tables. The waste air from manual degreasing of metal parts with trichloroethylene passed over an adsorber of activated coal was cleaned from a concentration of 23.7 g/cu m uncleaned air to less than 0.1 g/cu m. A wet electrostatic precipitator cleaned the waste gas from the manufacture of window sealing material for automobiles from a concentration fo 203 mg organic substance to 16 mg organic substance/cu m. Good results were also achieved with catalytic and thermal afterburners.

39166 **APTIC NO. 62737**

Hamilton, William

IMPACT STUDY OF ELECTRIC CARS FOR LOS ANGELES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 241-252. (Oct. 14-19.)*

A study of battery electric cars in Los Angeles for the years 1980, 1990, and 2000 is reviewed. National implications for regional electric car use are mentioned, including impact on environment, resources, economy, and society. Regional population is the key factor in baseline projections for Los Angeles. Growth rates nearly 50% less than anticipated several years ago were adopted for the baseline; continuation of long-standing trends in growth of automobiles per person was projected. The effects of electric car use on energy demand was projected. Electric car recharging will probably be accompanied by additional power plant emissions. Once the impact forecasts are completed, they will be combined with results of the electric car usage analysis and will be used to show the extent to which limited-capability electric cars are capable of the trips which people actually took in a recent year. This will be used to develop an estimate of electric car use.

39167 **APTIC NO. 62227**

Harboe, H.

FLUIDIZED-BED HEATERS FOR OPEN AND OPEN/CLOSED GAS TURBINE CYCLES. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-6-1 to V-6-2, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

The heat transfer coefficient between bed and cooling tubes in a fluidized bed combustor remains nearly constant over the permissible operating regime for a given design. This gives rise to substantial control problems when the combustor is used as a boiler. It is necessary to resort to bed-level control or compartmenting of the bed to obtain satisfactory turndown ratios. If instead, the combustor is used as an air or gas heater, it is possible to overcome these difficulties and readily achieve controlability from zero to full load. Water and steam in the cooling tubes will give a nearly constant tube wall temperature much below the bed temperature. With air in the tubes, the tube wall temperature can increase to provide much bigger variations in the difference between bed temperature and tube wall temperature. An air heater design concept for a 360-MW generating unit is described. The entire unit including combustors can be housed in a building having only 40% of the volume of a conventional boiler-turbine installation. Conventional open cycle gas turbines might be equipped with fluidized bed combustors.

39168 **APTIC NO. 62020**

Hardison, Leslie Claire

VENTURI SCRUBBER SYSTEM INCLUDING CONTROL OF LIQUID FLOW RESPONSIVE TO GAS FLOW RATE. *(Universal Oil Products Co., Des Plaines, Ill.) Brit. Pat. 1,325,030. 7p., Aug. 1, 1973. (Appl. Dec. 16, 1970, 11 claims).*

An improved scrubber system which incorporates a venturi section and means for maintaining a substantially constant pressure drop through the venturi throat section is described. The system provides for pressure measurements in the gas flow path and differential pressure control means operating responsive to it so as to regulate liquid flow into the venturi throat section. A substantially constant pressure drop is maintained in such section and a resulting constant efficiency retained in the system. The automatic regulation of the liquid introduction rate to the venturi throat section of the unit permits the elimination of a mechanical means used for modifying the size of the throat in the venturi and is an improvement over other systems.

39169 **APTIC NO. 61791**

Hasegawa, Keiji, Takumi Tsuda, and Hiroshi Aoike

DESULFURIZATION OF STACK GAS BY SODIUM SULFITE GYPSUM PROCESS. *(Aryuso sekkoho (Shoden Ehara-shiki) haien datsuryu sochi). Text in Japanese. Ehara Jiho (Ebara Times), no. 56:34-37, Dec. 1973. 7 refs.*

A sodium sulfite gypsum process for the removal of sulfur oxides from stack gas is described. Sulfur dioxide and sulfur trioxide are absorbed in a venturi scrubber by NaSO3 solution at very high efficiency. The solution, after being extracted from the scrubber circulation system, is neutralized by lime milk, making calcium sulfite which is separated from return Na2SO3 liquor in the following filter. Filtered CaSO3 cake is slurried and pumped to the reactor. It is oxidized by air to make calcium sulfate (gypsum) which is then separated centrifugally. The accumulation of sodium sulfate during the process is prevented by converting it to sodium bisulfite and gypsum.

39170 **APTIC NO. 62732**

Heitland

VOLKSWAGEN PROGRAM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 214-222. (Oct. 14-19.)*

A research program is described to reduce nitrogen oxides, unburned hydrocarbons, and carbon monoxide emissions from laboratory single-cylinder and four-cylinder stratified charge engines. The main parameters were studied by computer simulation and by basic combustion bomb experiments. Hydrocarbon and nitric oxide concentrations were related to mean effective pressure. While NO concentrations in the lower load range varied only slightly among themselves, a distinct advantage was noted in favor of the larger cross section passage at mean effective pressures above 4 bars. At low mean effective pressures, the HC concentrations were widely scattered. The larger passage was less favorable with regard to HC emissions. Injectors with low delivery pressures provided the best test results of all the injectors investigated. The influence of fuel distribution and ignition timing on emissions and the influence of intake air throttling on emissions are also discussed. Although no noticeable influence was evident on fuel consumption, intake air throttling was advantageous at low engine load because it produced a clear drop in emission levels. At high engine load, excessive throttling led to a renewed rise in emissions. From about half load, the engine could be operated without throttling. Stratified charge in a divided combustion chamber enabled a considerable drop in NOx emissions whereas reduction of HC emissions was a more difficult matter. However, in the case of the multi-cylinder engine, conditions for thermal oxidation in the exhaust system were favorable. Acceptable emissions with a minimum power loss could only be obtained by accurate control of the fuel quantities supplied to the main and pre-chamber and by throttling of the intake air in the part load range. Generally, performance, economic, driveability, and emission results with the specially designed compact fuel-injection pump and air cooled prechamber injection stratified charge Volkswagen engine were good.

39171 **APTIC NO. 62719**

Heller, Jack and Harold Rohlik

NASA COMPONENT SUPPORT FOR BASELINE ENGINE. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 110-115. (Oct. 14-19.)*

A study of automotive gas turbines by computer simulation is described. The program also includes an experimental test, and the experimental equipment are described. Calculations show that component improvements should result in a 40% fuel reduction at 20 hp, about 50% reduction at idle, about 30% reduction at 60% speed, and about 50% reduction over the Federal Driving Cycle.

39172 **APTIC NO. 62031**

Henkel, H. J., C. Koch, H. Kostka, and E. V. Szabo

COMPACT GAS GENERATOR FOR COMBUSTION WITH LOW LEVELS OF NOXIOUS PRODUCTS. *Siemens Forsh. Entwicklungsber., 2(1):1-4, 1973. 2 refs.*

The use of the cracked gas process to reduce noxious products released by the internal combustion engine without any increase in fuel consumption is described. The marked absence of dependence on the type of fuel used and on its antiknocking properties provides a complete solution to the lead problem in Otto fuels. The size and safety in operation of the crack carburetor are influenced by further developments in a catalytic system free of noble metals and also by the thermodynamic and technical optimation of flow in the device. There will also be a reduction in consumption because during the endothermic reaction of the hydrocarbon with carbon dioxide and water, the waste gas heat of the engine can be utilized to supply the required reaction energy and consequently to increase the overall efficiency of the engine crack carburetor system. The use of the crack carburetor principle is not restricted to Otto engines, but also provides considerable advantages when combined with other internal combustion engines. The crack carburetor can also decrease noxious products when installed preceding heating burners.

39173 **APTIC NO. 62228**

Henschel, D. B.

MINUTES OF PANEL DISCUSSION AND SUMMARY SESSION. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. VI-1--1 to VI-1-4, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

A panel discussion on fluidized bed combustion is described. The advantages of regenerating the spent sulfur dioxide-control sorbent that would be produced in a fluidized bed boiler, shortages and reserves of oil and gas, the energy crisis and its relation to emission control regulations, solutions to the fuel shortage, low-Btu coal gasification, fluidized bed combustion in which the pressurized fluidized combustor is operated without steam generating tubes in the bed, power generation using refuse as a fuel, and other aspects of fluidized bed combustion and gasification were mentioned.

39174 **APTIC NO. 61936**

Hisada, Soichi

PERFECT COMBUSTION DEVICE FOR AUTOMOTIVE EXHAUST GAS. *(Haikigasu kanzen nenshosochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-11721. 4p., April 16, 1973. (Appl. Dec. 30, 1968, 1 claim).*

Whereas a conventional exhaust gas afterburner system is designed only for removal of harmful contents of the exhaust gas by recombustion, the new recombustion system not only removes harmful contents from the exhaust gas but also utilizes energy produced by such recombustion. In an automotive engine using the main cylinder provided with the primary combustion gas exhaust port as well as main combustion chamber above it and with the main piston fitted inside in such a way that the piston may be free to move up and down, a concentric and annular sub- cylinder is newly provided around the lower part of the main cylinder. The sub-cylinder is provided with a combustion sub- chamber as well as the sub-piston that is structurally part of the main piston and moves up and down together with the main piston. A secondary air intake chamber is provided in the upper part of the sub-cylinder and there is a channel connecting the secondary air intake chamber with the combustion sub-chamber. This channel is so designed as to open only when the main piston comes very close to the top dead center. The primary combustion gas intake port provided in the middle portion of the sub- cylinder opens only when the main piston comes close to the bottom dead center. This intake port is further communicated with the primary combustion gas exhaust port of the main cylinder. The sub-cylinder is further provided with a secondary combustion gas exhaust port. An ignition plug is installed in the combustion sub-chamber as well. With this arrangement, the exhaust gas from the main cylinder is taken into the sub-cylinder and burned therein for removal of harmful contents as well as utilization of the energy produced by the recombustion of the exhaust gas. Equipped with this system, a four-cycle engine which gives one explosion per four strokes will have two additional explosions given by the sub-piston every four strokes, thus virtually becoming a 4/3 cycle type for much smoother operation.

39175 **APTIC NO. 62741**

Hoffman, Kenneth

HYDROGEN STORAGE IN VEHICLDS USING METAL HYDRIDES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 277-282. (Oct. 14-19.)*

There is considerable interest in hydrogen as a fuel because it has minimum pollution in its combustion products and is compatible with present and long-term energy sources. Practical, safe, and economical methods of storing H2 on-board a vehicle were studied. Metal hydrides can be used to store H2 until released by the heat of dissociation. The basic metal is recharged over and over with hydrogen; it is only necessary to remove the heat of reaction. On a volume basis the hydrides store as much energy as liquid hydrogen. Pressure versus composition isotherms in a typical hydrogen-metal system are presented. The dissociation pressures in hydrogen-metal systems and a schematic of a possible metal hydride fuel system are also presented.

39176 **APTIC NO. 61766**

Hoffmann, Werner

A CITY CAN BREATH AGAIN. *(Eine Stadt kann wieder atmen½) Text in German. Staedtehygiene (Uelzen/Hamburg), 24(12):272-274, 1973.*

For years a whole city was bothered by unbearable odors coming from the local purification plant for communal and commercial waste water. An initiative by the population led to an investigation of the problem; the odors can be eliminated by a modification of the purification process without necessitating expensive equipment for odor cleaning. The purification plant which was modernized after World War II is a fully biological plant with packed towers and succeeding aeration basin. For the past years the plant has been operated with a B.O.D. load 50% higher than planned. A theoretical investigation indicated that the biological stage is capable of coping with an excess load of 100% if certain peripheral conditions are met. One of these is sludge treatment which could not keep up with the steady increase of the population equivalents. As a consequence, a large quantity of untreated sludge had to be returned to the plant daily. In the past this sludge was returned discontinuously twice a day which led to B.O.D. peaks. For avoidance of the odor emissions, it was decided to return the untreated sludge continuously over the night hours and to dilute the return flow. The costs for the required modifications are estimated to amount to about $40,000 which is a fraction of the sum a new rotting tower would have cost.

39177 **APTIC NO. 62727**

Hood, Del and William Lear

WATER BASE TURBINE SYSTEM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 184-194. (Oct. 14-19.)*

A study of the Rankine engine is reviewed. The vapor generator was improved and a computer controlled test and data acquisition facility was designed and developed. System tests are now being initiated. The design point thermodynamic cycle, the laboratory schematic, photographs of the laboratory installation and power unit, a schematic of the vapor generator, the data acquisition schematic, and a random plot of emission data taken from the boiler are given. Based on present test work, an automotive steam engine is projected with low pollution capable of a 17 mpg fuel economy for a 100 hp engine in a 4500-pound car.

39178 **APTIC NO. 61764**

Hosho, Yukio

DEVICE TO REDUCE HARMFUL ENGINE EMISSIONS. *(Enjin no yugai haikigasu genshosochi). Text in Japanese. (Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-12481. 6p., April 20, 1973. (Appl. June 15, 1970, 3 claims).*

Several different approaches to reduction of harmful automotive emissions, especially nitrogen oxides, have been devised; namely, adjustment of ignition timing, use of an air/fuel ratio selected to avoid peak air/fuel consumption, exhaust gas recirculation system, water injection system, and catalytic converter system. While considerably effective in achieving the purpose, they inevitably produce side-effects adverse to engine performance, so that their practical applications are quite limited. The new harmful exhaust gas reduction system offered herein is based on the idea that the fuel will be fed at air/fuel ratio of 20 or so, a mixture ratio that minimizes NOx emission, and that the lowering of developed power due to combustion lag or poor performance of the engine due to possible misfiring at this mixture ratio will be prevented by providing two or more ignition devices. This system thus minimizes not only NOx but hydrocarbon and carbon monoxide emissions. The second claim of this invention is that the number of the ignition devices should be determined so as to provide about same combustion speed as achieved by one ignition device when the mixture ratio is 14-15. The third claim is that fuel feed device of this system may be equipped with an additional device designed to accelerate atomization and gasification of fuel.

39179 **APTIC NO. 62717**

Hucho, W. H.

VOLKSWAGEN GAS TURBINE RESEARCH. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 66, 69-76. (Oct. 14-19.)*

A research program for a gas turbine engine for automobiles with low exhaust emissions is reviewed. Special emphasis is being given to development of a low nitrogen oxide combustion system. Other work is aimed at reducing production costs by simplication of the two-shaft engine. Possible use of a single-shaft arrangement and increased temperatures, using ceramic parts, is being considered. The research engine is a two-shaft machine with regenerative air pre-heating and an integral reduction gear. The higher fuel consumption of the gas turbine compared to a piston engine (8.7 gal compared with 5.3 gal) was due to excessive idle consumption and higher fuel consumption at low steady speeds. The experimental gas turbine car already meets proposed emission standards up to 1976. The nitrogen oxide emission is above the 1977 standard, however. Improvements can be achieved with better fuel-air premixing, better combustion control, and exhaust gas recirculation. Thus, although the engine shows no significant advantages over the piston engine in vehicle road performance, it does show big advantages in low emission characteristics.

39180 **APTIC NO. 62718**

Huebner, George J., Jr., Charles Wagner, and Tom Golec

CHRYSLER BASELINE GAS TURBINE PROGRAM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 76-110. (Oct. 14-19.)*

The background, current status, and projections of a gas turbine research program are reviewed. Gas turbine fuel economy/ performance characteristics at present compare favorably with typical internal combustion engines and will be improved through peak power augmentation. The program will eventaully achieve the 1976 standard g/mi emission levels of .41 hydrocarbons, 3.4 carbon monoxide, and .4 nitrogen oxides. Program achievements to date, projective gains for automotive gas turbines, design of the engine, transient performance, response time for acceleration, collector pressure versus gas generator speed, curb idle fuel consumption (free versus gear rotor), free rotor test results for fuel flow versus core speed, ceramic regenerator drive/elastomer ring-gear mount, variable inlet guide vanes, and upgraded engine design plan are discussed and described. The program includes endurance tests to reach a goal of 3500 hours. Endurance test results are presented.

39181 **APTIC NO. 62742**

Hurter, Don

DOT/EPA STUDY. *North Atlantic Treaty Organization, Committee on the Challenges to Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 283-288. (Oct. 14-19.)*

A study is described to identify and evaluate individual technological improvements of optimized automobile designs, incorporating fuel conservation features for validation in vehicles in 1976. A 30% reduction in fuel consumption is the target. The study approach, goals, and evaluation factors are described. Various automobile manufacturers and component manufacturers have been contacted for information on potential fuel usage, performance, cost and time considerations, size and weight, and operating considerations of the 1976 vehicles. The status of the program and a preliminary evaluation of potential improvements are listed. Improvements include diesel engines for passenger cars, optimally matched conventional engines with I.V. and 3-4 speed transmissions, variable intake valve lift, high intensity ignition system, fuel injection with feedback control for optimizing air/fuel ratio, steel belted radial tires, aerodynamic improvement, 16-20% drag, dual range engine, weight reduction, standard air-conditioning with constant speed drive or improvement in cycle, constant speed drive for fan, alternator and power steering, limited fan speed and thermostatic control, stratified engines, and supercharger.

39182 **APTIC NO. 62124**

Iijima, Tokuzo, Akira Matsuoka, Yasushi Samejima, Yasuji Matsuoka, and Minoru Shiga

REMOVAL AND RECOVERY OF MERCURY IN GASEPHASE. *(Kitai-chu Suigin no jokyo kaishu-ho). Text in Japanese. Soda to Enso (Soda Chlorine), 24(11):389-393, Nov. 1973.*

In the process of electrolysis of aqueous solutions of sodium chloride by the mercury method, 10-15 mg/cu m of mercury vapor is emitted. To decrease mercury loss and prevent air pollution a closed system for removal and recovery of mercury has been studied. Exhaust gas containing mercury is washed by a sodium chloride aqueous solution containing chlorine in a packing tower or spray tower. Mercury is oxidized by chlorine and stabilized as Na_2HgCl_4 in solution. This solution is returned to the electrolysis tank and reduced to metallic mercury by a mercury anode. A flow sheet of the procedure is given. The factors effecting efficiency of recovery are pH, sodium chloride concentration, chlorine concentration, mercury concentration of the washing solution, the type of mis in the exhaust gas, and the apparatus for gas-liquid contact. Operation of the process at the Takasago factory where 2000 cu m/hr of exhaust gas is handled resulted in a lowering of the emitted mercury concentration to 5 micrograms/cu m. After this treatment, the emitted hydrogen gas contains about 5 ppm of chlorine. This hydrogen, however, is used to synthesize hydrogen chloride without any purification. The mercury concentration in the synthesized HCl is undetectable. It costs $800/mo to handle 5000 cu m/hr of hydrogen by this process, but since 108 kg of mercury is recovered there is a net profit of $200/mo.

39183 **APTIC NO. 61914**

Ikemori, Kikaku

SELECTION OF DUST COLLECTOR. *(Shujin sochi no kishu sentei). Text in Japanese. Kogai to Taisak (J. Pollution Control), 9(11):1115-1120, Nov. 1973. 6 refs.*

Methods of separating particles floating in gas include inertial separation, centrifugal force, scrubbers using coagulation with water, filter fabrics, electrostatic precipitation, gravity sedimentation, and ultrasonic collection. The most important factors for the selection of a collector are the size of dust particle, the value of the speed of gravity sedimentation, the density of particle, the ratio of specific gravity to true specific gravity, the adhering power, stickiness, cohesive force, diffusivity of dust, and the hydrophobe and hydrophile of dust. The most important factor for the evaluation of a dust collector is the concentration of dust in the gas at the outlet of the dust collector, and then the rate of dust collection. These factors are next taken into account: the space for dust collector, running and power costs, installation cost, and life-time.

39184 **APTIC NO. 62335**

Ingebo, Robert D. and Carl T. Norgren

HIGH-PRESSURE COMBUSTION EXHAUST EMISSIONS WITH IMPROVED AIR- ATOMIZING AND CONVENTIONAL PRESSURE-ATOMIZING FUEL NOZZLES. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN D-7154, E-7148, Work Unit 501-24, 23p., Feb. 1973. 8 refs.*

NTIS: N73-16929

In order to compare exhaust pollutant emissions and performance characteristics obtained with air-atomizing and pressure-atomizing fuel nozzles, a high pressure combustion was tested by burning ASTM A-1 fuel at inlet air pressures up to 20 atmospheres. Increasing the inlet air pressure from 4 to 20 atmospheres generally increased smoke number and the nitric oxide emission index, but decreased the carbon monoxide and unburned hydrocarbon concentrations for both air atomizing splash cone nozzles and pressure atomizing nozzles. Emission indexes for CO and unburned hydrocarbons were lower at 4, 10, and 20 atmospheres, and nitric oxide emission indexes were lower at 10 and 20 atmospheres with air atomizing than with pressure atomizing nozzles. Exhaust smoke numbers were near the visible limit with air-atomizing splash cone and pressure-atomizing nozzles at an inlet air temperature of 590 K. This temperature was considerably below 755 K, the design takeoff inlet air temperature, which would tend to give even lower smoke numbers. (Author summary modified)

39185 **APTIC NO. 61923**

Inoue, J.

REDUCTION OF NOX BY CHANGE OF FUELS. *(Nenryo tenkan niyoru chisso sankabutsu no teigen taisaku). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 65-98, 1973. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

Effectiveness of nitrogen oxides reduction by changing fuels is discussed in terms of modification of combustion techniques, fuel characteristics, energy saving, and total cost evaluation. The NOx emission factor reduces to 0.42-0.77 by changing a heavy oil to town gas. In a boiler or air conditioner, town gas combustion emits less NOx than combustion of A type heavy oil or heating oil in a range of fuel consumption rate from 100,000 to 50,000,000 kcal/hr. A low NOx exhaust recirculation burner developed recently emits less than half of the NOx emitted by a VS 250 burner. Performance of a town gas fueled batch system forging furnace with biased combustion was explained in terms of NOx emission, gas consumption, and furnace temperature. Finally, the total NOx reduction by changing heavy oil to town gas combustion was demonstrated for several examples of industrial furnaces such as forging, heat treatment, and annealing furnaces, which ranged from 82% for an annealing furnace to 52% for a continuous heat treatment furnace for steel rod.

39186 APTIC NO. 61738

Ito, Akio

METHOD AND APPARATUS FOR INCREASING OUTPUT OF CAR ENGINE AND PURIFYING EXHAUST GAS. *(Saiensu Kogyo Kabushiki Kaisha, Tokyo, Japan, Brit. Pat. 1,332,808. 4p., Oct. 3, 1973. (Appl. Nov. 4, 1970, 10 claims).*

A method and apparatus for increasing the output of an internal combustion engine by expediting the mixing of volatile oil and air so as to enhance combustion efficiency and to achieve maximum purification of exhaust gas, irrespective of the composition of fuel fed, are described. The apparatus consists of a means of feeding air and fuel independently to the carburetor and a manifold for receiving air/fuel mixture from the carburetor. There is a secondary air inlet to the manifold and an irradiation device in communication with the secondary air inlet and serving weakly to irradiate air passing through the latter to the manifold. The irradiation may consist of alpha rays, beta rays, or gamma rays obtained preferably from a natural member of the uranium series, radium series, or trium series. The system eliminates the quick vaporization or dissipation of boiling point components, a high amount of induced hydrocarbons, and residues of non-evaporated fractions during combustion.

39187 APTIC NO. 62352

Jaenike, Klaus

PROBLEMS OF WASTE GAS CLEANING IN THE CHEMICAL FIBER INDUSTRY. *(Probleme der Abgasreinigung in der Chemiefaserindustrie). Text in German. VEB Chemiefaserkombinat Schwarza Wilhelm Pieck, Kunstseidenwerk Siegfried Raedel Pirna, 13p., 1973. 15 refs. (Presented at the Verfahrnstechnische Jahrestagung, Halle, East Germany, June 27-28, 1973.)*

Chemical fibers are made of natural fibers or of synthetic, high- molecular compounds, which are either melted or dissolved. The use of solvents for dissolving the high-polymeric compounds brings problems of air pollution in its wake. The greatest air pollution problems are encountered in the viscose industry because of the great number of different products and the most varying technologies employed, and primarily because two pollutants, carbon disulfide and hydrogen sulfide, are always present in varying mixing ratios and concentrations. The two pollutants are very odorous. Emission concentrations of 0.2 to 0.3 mg/cu m have been measured in some distance from the emission source. Depending on the fiber about 330 to 400 kg carbon disulfide are used per 1000 kg fiber. For recovery of elimination of the pollutants from the waste air, a sufficiently high concentration would be necessary which is not permissible for reasons of occupational hygiene. For maintaining the maximum allowable working place concentration, the gases are highly diluted. Through encapsulation of the spinning machines, aa suitable concentration could be achieved, but for reasons of accessibility of the machines encapsulation is possible only to a limited extent. Presently CS2 is recovered only from the processes of fiber washing and bath preparation. Condensation is mostly employed here. Recovery rates of 30 to 50% can be achieved. Hydrogen sulfide is not eliminated. For this substance the methods of condensation, absorption, and adsorption are available. The most suitable method for the viscose industry seems to be the activated coal method. But any recovery of CS2 and hydrogen sulfide will bring just enough to cover the costs because of the low price of these substances.

39188 APTIC NO. 62645

Jones, Robert E. and Jack Grobman

DESIGN AND EVALUATION OF COMBUSTORS FOR REDUCING AIRCRAFT ENGINE POLLUTION. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 31-1-31-8. 28 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Research in reducing exhaust emissions from turbine engines that is being conducted at the National Aeronautics and Space Administration s Lewis Research Center is summarized. Various techniques employed and the results of testing are briefly described and referenced for detail. The greater part of the research is focused on reducing the oxides of nitrogen formed during takeoff and cruising in both advanced CTOL, high pressure ratio engines, and advanced supersonic aircraft engines. The experimental approaches include: multizone combustors incorporating reducing dwell time, fuel air premixing, air atomization, fuel prevaporization, water injection, and gaseous fuels. Tests are also being conducted on full annular combustors at pressures up to 6 atm and on combustor segments at pressures up to 30 atm. Studies are also being conducted on the use of diffuser bleed and variable combustor geometry to try to optimize the combustor airflow distribution over a wide range of operating conditions. The effect of inlet air humidity on the generation of nitrogen oxides was studied as well as the very effective technique of direct water injection. The emission characteristics of natural gas and propane fuels were measured and compared to those of ASTM-Al kerosene fuel. (Author summary modified)

39189 APTIC NO. 62739

Kant, Fred

ALTERNATIVE FUELS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 255-267. (Oct. 14-19.)*

A study of alternative fuels is reviewed. An initial list of candidate fuels was prepared which includes conventional fuels from unconventional sources, such as shale and coal liquids, as well as unconventional fuels, such as alcohols, hydrogen, and ammonia. The overall program plan is described. First the fuels are selected on the basis of cost of manufacture and distribution, availability, vehicle compatibility, toxicity, safety, and efficiency of use. The fuels analyzed on this basis are shale gasoline, shale distillate, coal gasoline, coal distillate, methanol, ethanol, hydrogen, methane, ammonia, hydrazine, and gasoline. Then the physical and chemical properties of the candidate fuels are considered.

39190 APTIC NO. 62654

Kaupert, Andrew

EVALUATION OF AN ENGINE EXHAUST AND FUEL GASIFICATION DEVICE-- INVENTOR, MR. SETH LEE, JR. *Environmental Protection Agency, Washington, D. C., Emission Control Technology Div., Rept. 74-14-AWK, 4p., Oct. 1973.*

The evaluation of the Lee engine exhaust and fuel gasification device is described. The device is a heat exchanger in which the exhaust gas is used to heat the incoming air/fuel mixture. Device testing was performed using a 1962 Chevrolet equipped with a 235 CID engine and standard manual transmission. The vehicle demonstrated hydrocarbon and carbon monoxide levels approximately equivalent to those of a 1970 to 1971 vehicle. The nitrogen oxides level was considerably lower than would be expected for an early exhaust emission controlled vehicle due to the exhaust gas recirculation employed. Fuel economy was poorer than a stock 1962 Chevrolet. (Author conclusions modified)

39191 **APTIC NO. 62687**

Kaupert, Andrew

AN EVALUATION OF THE BOSE AUTOMOBILE ANTI-AIR POLLUTION DEVICE. *Environmental Protection Agency, Washington, D. C., Emission Control Technology Div., Rept. 74-20 AWK, 4p., Dec. 1973.*

The evaluation of the Bose automobile anti-air pollution device is described. The device recycles refined combustion gases back to the inlet of the carburetor for reburning. Additional air is supplied by means of a blower to achieve a lean mixture over all engine speeds. Three valid tests were conducted on a 1965 Ford Fairlane, 200 CID. There was a reduction of hydrocarbons and carbon monoxide emissions with no effect on oxides of nitrogen. These reductions are consistent with enleanment techniques, except that NOx did not significantly increase. There was a modest increase in fuel economy and an increase in aldehydes. (Author conclusions modified)

39192 **APTIC NO. 62207**

Keairns, D. L., D. H. Archer, J. R. Hamm, R. A. Newby, E. P. O Neill, J. R. Smith, and W. C. Yang

EVALUATION OF THE FLUIDIZED-BED COMBUSTION PROCESS. VOLUME I - PRESSURIZED FLUIDIZED-BED COMBUSTION PROCESS DEVELOPMENT AND EVALUATION. *Westinghouse Electric Corp., Pittsburgh, Pa., Research Labs., Environmental Protection Agency Contract 68-02-0217 Proj. ROAP 21ADB-09, Program Element 1AB013, Rept. EPA-650/2-73- 048a, 380p., Dec. 1973, 65 refs.*

NTIS: PB 231162/AS

Results are given of a process evaluation of pressurized fluidized-bed combustion for power generation. Preliminary plans and a cost estimate are given for a 30 MW fluidized-bed boiler. The project team and a program to demonstrate fluidized-bed oil gasification/desulfurization for power generation on a 50 MW plant are described. Pressurized oil gasification for combined- cycle power plant generation is evaluated. No problems are identified which preclude the development of pressurized fluidized-bed combustion combined-cycle power plants and fluidized-bed oil gasification power plants which can generate electrical energy within environmental goals at lower energy costs than competitive systems. Economic sensitivity, operating conditions, boiler design, particulate removal system economics, laboratory support studies, regeneration systems assessment, plant operation and control, and alternative pressurized fluid bed boiler concepts (adiabatic combustor combined cycle power plant and recirculating bed boiler design) are discussed.

39193 **APTIC NO. 62208**

Keairns, D. L., D. H. Archer, J. R. Hamm, R. A. Newby, E. P. O Neill, J. R. Smith, and W. C. Yang

EVALUATION OF THE FLUIDIZED-BED COMBUSTION PROCESS. VOLUME II - FLUIDIZED-BED BOILER COMBINED-CYCLE POWER PLANT DEVELOPMENT- - VOLUME I APPENDICES. (FINAL REPORT). *Westinghouse Electric Corp., Pittsburgh, Pa., Research Labs., Environmental Protection Agency Contract 68-02-0217, Proj. ROAP 21ADB-09, Program Element 1AB013, Rept. EPA-650/2-73-048b, 258p., Dec. 1973, 34 refs.*

NTIS: PB 231163/AS

Results are given of a process evaluation of the pressurized fluidized-bed combustion system for power generation. Preliminary plans and a cost estimate are given for a 30 MW fluidized-bed boiler development plant. The project team and a program to demostrate fluidized-bed oil gasification/desulfurization for power generation on a 50 MW plant are described. Pressurized oil gasification for combined-cycle power generation is evaluated. No problems are identified which preclude the development of pressurized fluidized-bed combustion combined-cycle power plants and fluidized-bed oil gasification power plants which can generate electrical energy within environmental goals at lower energy costs than competitive systems. The appendices included cover boiler tube specifications, supplementary cost data, a parametric study of the elutriation rate from a fluidized bed boiler, base design, temperature control and process turndown, effect of boiler conditions, once-through process, constant load concept, process comparisons, a general study of a one-step process, low-sulfur coal, limestone wet scrubber cost, part load plant operation, and recirculating bed boiler studies.

39194 **APTIC NO. 62248**

Keairns, D. L., W. C. Yang, J. R. Hamm, and D. H. Archer

FLUIDIZED-BED COMBUSTION UTILITY POWER PLANTS--EFFECT OF OPERATING AND DESIGN PARAMETERS ON PERFORMANCE AND ECONOMICS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-2-1 to IV-2-50, EPA-650/2-73-053, 6 refs. (Dec.)*

NTIS: PB 231977/AS

Pressurized fluidized bed boiler power plants have the potential to meet sulfur dioxide, nitric oxide, and particulate emission standards at energy costs 10% below conventional plants with wet scrubbing. The sensitivity of the operating and design parameters selected for the plant design on plant performance and economics are analyzed. The plant costs and performance are essentially invariant with projected changes in operating and design parameters and 2.5% change in energy cost. A potential change in bed temperature, fluidizing velocity, heat transfer surface configuration, gas side heat transfer coefficient, boiler tube materials, bed depth limitations, or pressure will result in less than 2% increase in plant cost and less than 0.2 mills/kWhr increase in energy cost. Increasing the dust loading to three times the design value will increase the plant cost approximately 4% and the energy cost less than 0.3 mills/kWhr. Increasing excess air will result in increased turndown capability and performance, 3-6% increase in plant cost, and no significant change in energy cost. Plant efficiencies of approximately 45% may be achieved in gas turbine inlet temperatures above 2000 F and steam temperatures of 1200 F. (Author abstract modified)

39195 **APTIC NO. 62501**

Kennerley, R. A., D. A. St John, and R. P. Eardley

MEREMERE FLY ASH AS A CONCRETE ADMIXTURE. *N. Z. J. Sci., vol. 16: 855-874, 1973, 16 refs.*

Fly ash obtained as a waste product from the coal-fired power station at Meremere has been investigated for its possible use as a concrete admixture. Seven random samples were analyzed by chemical, X-ray, and thermal analysis methods and by optical and scanning electron microscopy. The composition of the ash was variable but typical of ash derived from sub-bituminous type coals. The mild hydraulic properties of the fly ash were confirmed and were due to the formation of ettringite and the hydration of dicalcium silicate present in the ash. Physical tests indicated the pozzolanic activity of the ash to be low because of its comparative coarseness, but this was improved greatly by grinding. Performance tests on fly ash-cement mortars showed the ash to be suitable for use in concrete up to a rate of 25% by weight of the cement. Meremere fly ash is suitable for use as an admixture to concrete, but caution will be required in its use because of its variable composition. The composition and physical properties of Meremere fly ash compared with the major overseas standards relating to fly ash for use in concrete. (Author abstract)

39196 **APTIC NO. 62744**

Kimball, Dave

EPA FUEL ECONOMY DATA FROM 1973 AND 1974 MODEL YEAR VEHICLES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 295-300. (Oct. 14-19.)*

Fuel economy data for 1973 and 1973 cars were calculated using exhaust emission test results. The carbon balance methods gave average fuel economy values 4% higher than the weight methods due to fuel evaporation losses. A comparison of national average fuel economy data for calendar and model years since 1966 are shown. The data for 1974 model year cars are also given. A comparison of this data with 1973 model year data is shown. If the same weight distribution is assumed for 1973 and 1974 as in 1972, then 1974 models show a 3% fuel economy penalty. Two counteracting general trends in the automobile business were noted. The same model cars seemed to be getting heavier due to safety requirements and accessories; more cars were sold in the smaller weight class.

39197 **APTIC NO. 61863**

Kito, Masakazu and Y. Wen

SIMULATION OF THE SULFUR DIOXIDE-LIMESTONE REACTION SYSTEM. *(Nisanka-io sekkaiseki hannokei no shimyureishon). Text in Japanese. Preprint, Japan Society of Chemical Engineers, Tokyo, p. 147-148, 1973. 6 refs. (Presented at the Japan Society of Chemical Engineers, Fall Meeting, 7th, Nagoya, Japan, Oct. 13-16, 1973.)*

The removal of sulfur dioxide by reaction with the calcium oxide produced by the decomposition of limestone in a boiler is calculated mathematically. The rates of decomposition of limestone and CaO are calculated for high and low concentrations of SO2. These calculations agree with experimental results from the TVA desulfurization process.

39198 **APTIC NO. 62722**

Kormanyos, K.

OWENS-ILLINOIS OXIDE RECUPERATOR DEVELOPMENT. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 151-158. (Oct. 14-19.)*

A program to examine the potential of a low expansion, oxide, compact recuperator for application in an automotive gas turbine system is reviewed. The scope of the work includes parametric design analysis, fabrication feasibility, conceptual design analysis for specific engine requirements, fabrication and testing of scaled down cores under approximate engine conditions, seal development, and recuperator cost analysis.

39199 **APTIC NO. 62728**

Kreeger, Al

ORGANIC FLUID TURBINE SYSTEM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 194-199. (Oct. 14-19.)*

Research on an organic Rankine cycle automotive engine is reviewed. Program accomplishments include system synthesis studies, selection and testing of a working fluid, engine design and fabrication, and preprototype engine testing. The engine operates with a proprietary working fluid designated AEF-78. The fluid has demonstrated superior thermal stability in tests of several thousand hours. Peak fuel economy was 16 mpg. Federal Driving Cycle emissions were 0.149 g/mi nitrogen oxides, 0.317 g/mi carbon monoxide, and 0.053 g/mi hydrocarbons. Operating characteristics, results of engine tests, feedpump design changes, turbine design modifications, and prototype engine fuel economy performance are reviewed.

39200 **APTIC NO. 62715**

Kuhlmann, P.

STAGE OF DEVELOPMENT OF THE STIRLING ENGINE AT THE M.A.N. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 56-61. (Oct. 14-16.)*

Stirling engine development at the M.A.N. company in Germany is summarized. Because of more stringent air pollution regulations, new power sources for trucks and buses are being developed including improved diesel engines, stratified charge engines, Stirling engines, liquefied natural gas engines, gas turbines, and electric engines. In measurements of a 4-cylinder Stirling engine with 120 hp at 1500 rpm, exhaust emissions were 4.0 g/hph nitrogen oxides, 0.7 g/hph carbon monoxide, 0.01 g/hph hydrocarbons, and 0 soot. Nitrogen oxides can be further reduced by special modifications such as exhaust gas recirculation. Stirling engines also have low noise level, overall efficiency of about 33%, multifuel capability, and easy adaptability to many applications. The air preheater transmitted the exhaust heat to the combustion air to increase the efficiency of the Stirling engine. A tube and jacket-type heat exchanger was used in a single cylinder engine.

39201 **APTIC NO. 62090**

Larson, D. H. and D. R. Shoffstall

AERODYNAMIC CONTROL OF NITROGEN OXIDES AND OTHER POLLUTANTS FROM FOSSIL FUEL COMBUSTION. VOLUME II. RAW DATA AND EXPERIMENTAL EQUIPMENT. *Inst. of Gas Technology, Chicago, Ill., Environmental Protection Agency Contract 68-02-0216, Proj. ROAP 21ADG47, Program Element 1A2014, Rept. EPA-650/2-73-033b, 491p., Oct. 1973. 3 refs.*

Raw data and data plots collected during testing for burner types for nitrogen oxide emission reduction are presented. Dimensional descriptions of the hot-modeling furnace, the cold-modeling furnace simulator, sampling probes, instrumentation, and the test burners are given. The experimental facilities are described. The burners tested for nitrogen oxide-nitric oxide, methane, carbon monoxide, carbon dioxide, and hydrocarbon emissions were an intermediate-flame-length ported baffle burner, a short-flame- length ported baffle burner, a movable-block swirl burner, a high-intensity flat-flame burner, and a boiler burner. The computer program for reduction of velocity data, the cold-model study of an axial flow burner with a flow nozzle, a study of velocity measurement dependence on five-hold pitot probe orientation, a method of calculating the swirl number, and a computer program for data transformation and plotting tracer-gas mixing results are discussed in appendicies.

39202 **APTIC NO. 62644**

Lefebvre, A. H. and R. S. Fletcher

A PRELIMINARY STUDY ON THE INFLUENCE OF FUEL STAGING ON NITRIC OXIDE EMISSIONS FROM GAS TURBINE COMBUSTORS. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 30-1-30-7. 5 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A preliminary study was conducted on the influence of fuel staging on nitric oxide emissions from gas turbine combustors. Measurements of NO exhaust emissions were carried out over a range of fuel flows to both primary and secondary zones and the results compared with predictions based on a previously derived mathematical model. When the standard liner was operating with two stages of fuel injection, approximately 75% of the fuel was injected into the primary combustion zone and the remainder into the secondary combustion zone. The effect of staging the fuel injection was to reduce appreciably the exhaust concentration of NO. The experimental and predicted values tally reasonably well and thereby strengthens the validity of the mathematical model used to simulate NO emissions. (Author summary modified)

39203 **APTIC NO. 62720**

LeFevre, Harvey and Leon Lewis

AIRESEARCH INTEGRATED CONTROL SYSTEM FOR THE BASELINE PROGRAM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 117-133. (Oct. 14-19.)*

The Baseline Gas Turbine Engine control system is hydromechanical and open-loop. It is simple, reliable, and low cost. The design of the system is discussed and shown in drawings. Primary zone model emission characteristics for the 10-inch diameter can versus the axial combustor are presented in a diagram of nitrogen oxide and carbon monoxide emissions. The can system meets program emission goals over a narrow range of operating conditions. The primary zone folded annular models are generally superior to the can with regard to low emissions. A program is underway to develop a more accurate integrated control system than the Baseline system. This control system will be optimized for fuel economy, low emissions, good vehicle performance, low manufacturing cost, and reliability. The conceptual design of the overall control system is presented schematically. The program plan has been developed around this approach and is structured to provide a cost-effective design capable of mass production. The initial approach is based upon an electronic computer that is fabricated using large-scale-integration microcircuit techniques.

39204 **APTIC NO. 62835**

Linde, Robert von and Loachim von Linde

DESORPTION FROM CHARGED ACTIVE CARBON BEDS. *(Anlage zur Desorption beladener Adsorbentien). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,134,632. 10p., Jan. 18, 1973. (9 claims).*

A process for the desorption of organic and inorganic vapors from adsorbents, and especially from activated carbon, is described. Desorption is done by means of a gas stream containing carbon monoxide and hydrogen, generated by the substoichiometric combustion of fuel oil at an air-excess coefficient of 0.065-0.8. The combustion gas is cooled to below 600 C by water spray prior to contacting the adsorbent layer. The gases from the substiochiometric combustion supply heat for the primary and/or secondary combustion air. Part of the combustion gas is returned before the absorbent layer to reduce the percentage of water vapor. The desorbed vapors are incinerated catalytically to yield carbon dioxide, nitrogen, and steam.

39205 **APTIC NO. 62745**

Lindsay, Roger and John L. Wilson

POTENTIAL OF HEAT PIPE FOR NEAR TERM REDUCED FUEL CONSUMPTION AND POLLUTION. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 301-307. (Oct. 14-19.)*

A heat pipe is a self-contained boiling-condensing system in which the condensate is pumped from condenser to boiler under the action of capillary forces. The device has a number of unique characteristics which make it an appropriate means of transferring exhaust heat to vaporize gasoline. The arrangement of the heat pipe is described and discussed. By recovering and transferring heat, the heat pipe can reduce fuel consumption and thus engine exhausts. In some versions the device is used to transfer heat from the exhaust gases to the boiler. A chart is given showing the amount of hydrocarbons, carbon monoxide, and nitrogen oxides produced by a standard car, a car with the heat pipe on a standard setting, and a car with a heat pipe on a lean setting when the cars were run through various tests.

39206 **APTIC NO. 62736**

Ljungstrom

ROTARY ENGINES IN SWEDEN. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 239-240. (Oct. 14-19.)*

A twin rotor rotary engine was developed and tested to 200 hp at 2000 rpm and 23% thermal efficiency. This type of engine can be designed as a spark ignition or compression ignition engine. It is light weight and compact. It has a relatively smooth operation with 3 torque pulses per revolution rather than one as in the Wankel engine. Seals are similar to those in the Wankel engine.

39207 **APTIC NO. 61970**

Lord, William H.

TRANSPORTATION OF SLUDGES AND OFF-SITE DISPOSAL. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 305-333, 347-350. (Oct. 31.)*

The increased operational and environmental problems associated with waste disposal for sludge from sulfur dioxide scrubbers require an efficient, economical, environmentally suitable, and sound engineering system. The chemical additive system to obtain stabilized sludge for landfill appears to be the only currently feasible method that will meet all the economical, technical, and environmental problems of sludge disposal. The bulk density of the sludge, specific gravity of dry solids, particle size, shape, and gradation, and chemical composition of the sludge solids and supernatant liquid were determined for sludges. X-ray diffraction studies, settling tests, and filter tests were given. The stabilization and soil mechanics for the sludge samples were then determined. The stabilized sludge was then tested in a laboratory to determine its properties compared to known soil types for use in the design of landfills. General index properties, strength, and consolidation characteristics were determined. A system was developed for transporting the sludge by truck, pipeline, or barge to the disposal site. These transportation methods and disposal site selection are discussed.

39208 **APTIC NO. 62243**

Lunn, H. G., A. G. Roberts, and H. B. Locke

COMBUSTION OF RESIDUAL FUEL OILS IN FLUIDISED BEDS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-5-1 to V-5-9, EPA-650/2-73-053. 3 refs. (Dec.)*

NTIS: PB 231977/AS

Fluidized bed combustion of residual fuel oils was studied. Information is presented on heat transfer, atmospheric pollution, oil injection systems, corrosion of immersed metal surfaces, and the current and projected work program. High combustion efficiencies (greater than 99.5%) were attainable with low nitrogen oxide emissions (100 ppm). Sodium and vanadium retentions were encouragingly high; sulfur dioxide emissions could be reduced to low levels by the addition of limestone or dolomite. (Author abstract modified)

39209 **APTIC NO. 61918**

Maruoka, Y.

ON THE LOW NOX BURNER. *(Chisso sankabutsu teigen bana ni tsuite). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 53-64, 1973. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

Descriptions are given of the practical methods of nitrogen oxides emission reduction such as low excess air combustion, two-stage combustion, exhaust gas recirculation, off-stoichiometric combustion, modification of burner arrangement and furnace design, division of flame, the use of a number of small capacity burners, injection of steam and water, lowering of preheating temperature of combustion air, the use of low nitrogen content fuel, operation at a low thermal load, and modification of burner structure. A low NOx oil burner has been developed recently based on the low NOx burner developed by the Surface Combustion Division of Midland Ross Corp. This burner burns 6-30 l/hr of heating oil at an air-to-fuel ratio of 1.1, air pressure of 600 mm H2O, and oil pressure of 0.4 kg/sq cm. This burner emitted less NOx than a standard type burner did. Two stage combustion, exhaust gas recirculation and injection of steam into the flame were combined with the low NOx oil burner and the amount of NOx emission was reduced to 1/3 to 1/5.

39210 **APTIC NO. 61619**

Matsushita, Masao

DUST SEPARATOR. *(Entstaubungsgeraet). Text in German. (Matsushita Dendokogu Co. Ltd., Osaka (Japan)) W. Ger. Pat. Appl. 2,201,394. 5p., Feb. 22, 1973. 6 refs. (5 claims).*

A wet type separator to remove dust from air is described. Dusty air is admitted into a tube from which the air is forced into a wash liquid through a cup-like component. The cup-like component is connected at its upper edge to a horizontal baseplate near a baffle. The cup, baseplate, and baffle act as splash surfaces, and are mounted on a swimmer floating on the liquid surface.

39211 **APTIC NO. 55573**

Matteson, Michael J. and Philip J. Giardina

MASS TRANSFER OF SULFUR DIOXIDE TO GROWING DROPLETS-THE ROLE OF SURFACE ELECTRICAL PROPERTIES. *Preprint, American Chemical Society, Washington, D. C., 29p., 1973. 17 refs. (Presented at the American Chemical Society, National Meeting, 166th, Chicago, Ill., Aug. 26-31, 1973.)*

The surface electrical properties of water were studied to determine their role in the adsorption of sulfur dioxide in the 750-4000 ppm range from growing water droplets in scrubbers. Mass transfer rates were first measured without and then in the presence of applied surface charge. The rate of mass transfer could be increased by about 60% by applying a surface charge density of 6 statcoulombs/sq cm. Other variables studied were SO2 concentration and relative humidity of the carrier gas. The rate of mass transfer was linearly dependent on SO2 concentration, but no dependency on humidity was observed. An adsorption theory is proposed which relates the mass transfer rate to a number of adsorption sites, the number density of which is increased by applying surface charge. (Author summary)

39212 **APTIC NO. 62253**

Matthews, C. W.

A DESIGN BASIS FOR UTILITY GAS FROM COAL. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid Bed Combust., 3rd, 1973, p. IV-7-1 to IV-7-12, EPA-650/2-73- 053. 3 refs. (Dec.)*

NTIS: PB 231977/AS

The preliminary design of a coal gasification plant for manufacturing clean utility fuel gas for the electric power industry is described. By soaking the gas at high temperature, tars and oils which may be evolved are thermally cracked to gas and carbon. Elimination or reduction of tars and oils in the raw gas will reduce heat exchanger fouling and will simplify by-product and waste-stream cleanup and treatment. Most of the dust contained in the gas is removed by cyclone separators and returned to the bed. Most of the sulfur produced by coal gasification appears in the form of hydrogen sulfide which is then scrubbed from the gas and converted to elemental sulfur. Plant cost and product energy cost of the system will be less by a significant amount than those costs for an equivalent-size synthetic pipeline gas plant.

39213 **APTIC NO. 62202**

McEntire, Barnard R. and Ray Skoff

HYDROCARBON VAPOR CONTROL AT GASOLINE SERVICE STATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1973. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-333.)*

Hydrocarbon vapor control systems for gasoline service stations were developed to meet the objectives of Rules 61 and 63 of the San Diego County Air Pollution Control District which require recovery of displaced vapors emitted from liquids with vapor pressures greater than 1.5 psia. The recovery or disposal units must prevent at least 90% by weight of the HC entering them from being emitted into the atmosphere. These units were also designed to ensure that control objectives would be met under field conditions. These objectives can be achieved with systems whose costs are in line with those currently demanded by motorists and industries. The physical characteristics of gasoline are described. Gasoline is not a single component, but rather a liquid with substantial amounts of dissolved gases. Gas chromatographic analysis of the liquid revealed that from 10 to 20% or more of the molecules would, by themselves, exist as gases, depending on composition, vapor pressure, and temperature. These factors control the losses of vapors during transfer of gasoline to the vehicle, spillage, storage, and bulk delivery. Results are given of vapor recovery during vehicle loading. The basic control methods are absorption, adsorption, refrigeration, liquefication, and thermal oxidation. Simple displacement is not a control method, but is accepted widely for temporary storage. Adsorption of vapors in a carbon canister is the simplest control system. In order to overcome the need to transport canisters for larger service stations, two manufacturers are making systems with on-site regeneration of carbon. When the initial adsorption efficiency of 99% decreases to 94%, the carbon is regenerated. Refrigeration and compression-liquefication systems are also being studied. The nozzle interface between the car filler neck and the vapor recovery device is very important. A vapor recovery nozzle with a wide flange for external fit or a cone for internal fit is suitable for 90-99% of all cars. A leak-tight fit is not necessary if a small vapor recovery pump is used to produce a negative pressure of 0.2-0.5 in. of water at the nozzle.

39214 **APTIC NO. 62735**

McFadden, John J.

EPA DIESEL STUDY STATUS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern*

Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 233-235. (Oct. 14-19.)

A technical feasibility study and evaluation assessment was carried out on four light-duty vehicles powered by diesel engines to establish the potential of diesel engines for low exhaust emissions. An inherent low emission capability suitable to meet the 1975 standards was demonstrated by all vehicles except the Peugeot, which had a special deferred injection timing to reduce idle noise. Average fuel economy exceeded that of standard vehicles in the 3000-3500 lb range. Further studies on gaseous emissions from diesels and their health effects were initiated.

39215 **APTIC NO. 62771**

McJones, Robert Wayne

IMPROVEMENTS IN OR RELATING TO CONTROLLING EXHAUST GAS POLLUTION. *(Assignee not given.) Brit. Pat. 1,327,513. 8p., Aug. 22, 1973. (Appl. April 19, 1971, 7 claims).*

A process for minimizing exhaust gas pollutants from internal combustion engines is described. Current effort to reduce exhaust gas emissions is being directed to engine operation with a lean air to fuel ratio just slightly leaner than stoichiometric. However, it was found that very lean engine operation on a gaseous fuel reduced oxides of nitrogen, hydrocarbons, and carbon monoxide to acceptably levels. A method of operation was developed that consists of mixing a gaseous fuel with air to obtain an air-gaseous fuel mixture with an equivalence air-to-fuel ratio of from 1.25 to 1.35; introducing the mixture into a combustion chamber of the internal combustion engine for burning; on reaching a full or nearly full throttle setting enriching the air-to-fuel ratio to slightly richer than stoichiometric, and returning the equivalence air-to-fuel ratio to the range of from 1.25 to 1.35 at a throttle setting below that required to initiate said enriching step.

39216 **APTIC NO. 62751**

Michael, Bruce

EVALUATION OF A RENAULT PROTOTYPE LOW EMISSION VEHICLE. *Office of Air and Water Programs, Washington, D. C., Emission Control Technology Div., Rept. 74-12 RB, 3p., Sept. 1973.*

The evaluation of a prototype low emission vehicle designed by Renault is described. Two emission trials were performed on a 1973 Renault 15 sedan with engine modifications, a Bosch air injection pump, and an Engelhard monolithic catalyst which was located a few feet downstream of the exhaust manifold in the exhaust system. Carbon monoxide, hydrocarbons, and nitrogen oxides were measured. Two two tests were run differently: the idle carbon monoxide was raised after the first test from about 2.3% to 3.3% and the choke was operated differently. At the start the carburetor was fully choked on both tests, then at about 25 sec into the test the choke was let off about half way on the first test, but not quite as far on the second. At about 170 sec into the test the choke was pushed fully off on both tests. For about 145 sec the choke was in different positions for the two tests. At low mileage the Renault showed the capability of not only meeting the 1975 California standards, but also the 1976 Federal emission interim standards.

39217 **APTIC NO. 62713**

Michels, A. P. J. and R. J. Meyer

STATE OF THE ART OF THE DEVELOPMENT OF THE STIRLING ENGINE WITH EMPHASIS ON THE LOW POLLUTION POTENTIAL AND LOW FUEL CONSUMPTION. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 18-34. (Oct. 14-19.)*

Research on the Stirling engine, based on a closed cycle, is reviewed. This hot-air engine can be used in a variety of applications including yachts, cars, and buses. Several light-weight and compact engines have been developed. In 1973, a study was begun on the possibility of Stirling engine development for vehicular applications in the U. S. In a test of a 170 Bhp engine of 4600 lbs, concentrations of unburned hydrocarbons, carbon monoxide, and oxides of nitrogen were 0.2, 1.2, and 0.14 g/mi, respectively. The Stirling engine is quiet, meets 1976 emission standards, is simple, gives better fuel consumption so that high compression ratio gasoline engines before emission controls, can operate on a wide range of fuels, has long service life, requires no lube oil consumption, is reliable in starting and has good economy of operation. It is also very easy to use hydrogen for the fuel.

39218 **APTIC NO. 61972**

Miller, W. E.

FIRST RESULTS WITH HANDLING ACID. THE CAT-OX SYSTEM AT ILLINOIS POWER COMPANY. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 389-394. (Oct. 31.)*

The Monsanto Cat-Ox System at the Wood River Generating Station of the Illinois Power Company is described. Since natural gas was not available for normal operation of the unit, it was modified to use No. 2 fuel oil. Since this caused too much pollution, an external reheat burner is being constructed which will be fired on No. 2 fuel oil, and the heat will be ducted into the system. During operation on the fuel oil, the system produced 82.8% strength sulfuric acid. The stack gas contained an average of 0.4 mg H2SO4 acid mist/cu ft. Conversion of sulfur dioxide to sulfur trioxide was 92.9%, and fly ash removal efficiency was 99.5% by the electrostatic precipitator. The system removed 91.4% of the SO2 in the stack gas. The packed-bed absorbing tower operates in conjunction with an external shell and tube heat exchanger to form the H2SO4 by combining water and SO3. Thus far, the Cat-Ox System has operated for 404 hr and has produced 1400 tons of acid. The technology and fundamental chemical processes of the Cat-Ox System have been proven; however, reliability and economics of operation and maintenance of the components to H2SO4 must be determined in the future test period. The H2SO4 produced will find a ready market in the production of farm fertilizers and in the steel industry.

39219 **APTIC NO. 61967**

Minnick, L. John and Richard D. Vaughan

NEW DIMENSIONS IN ASH HANDLING DUE TO ENVIRONMENTAL SYSTEMS CALCIUM SLUDGES. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 219-233, 303. (Oct. 31.)*

Typical sulfur oxide removal systems used by electric utilities remove SOx by absorption with limestone or lime in wet scrubbers. This produces a sludge which is often discharged into ponds or lagoons. Fly ash which is collected by other equipment is disposed of by dumping into lagoons or on dry land. However these can pollute water or repollute the air. Additives can be [illegible]ed with the fly ash and sludges to form a solid stable material. Cementing compounds can be produced in the sludge/fly ash mixtures incorporating as much as 50% by weight of water in the crystalline form. Analysis of the permeability of the fixed material showed a decrease of permeability. The leachate of the material met drinking water standards. The usefulness of this mixture will depend on various costs such as transportation, disposai of by- products, and cost of converting the material.

39220 **APTIC NO. 62779**

Miura, Mitsugi

METHOD AND APPARATUS FOR PURIFICATION OF GAS. *(Assignee not given.) Brit. Pat. 1,320,786. 11p., June 20, 1973. (Appl. June 23, 1970, 13 claims).*

A method and apparatus are described for effectively removing fine particle-solid substances such as dust or fumes contained in the air or other gases; for treating sulfurous acid gas, nitric acid gas, or unpleasant odors; and for absorbing or neutralizing gases produced during chemical processes. There is a uniform contact of gas and liquid which are centrifugally separated. In conventional methods, as the rate of contact between the gas and liquid is low, the liquid must be supplied repeatedly in order to improve the efficiency and therefore the amount of liquid used is increased. This in effect increases water drainage.

39221 **APTIC NO. 62130**

Miyanami, Kei

STUDIES ON THE ELIMINATION OF BAD ODORS. 5. ELECTROSTATIC METHOD (ELECTRODE METHOD). *(Akushu jokyo ni kansuru kenkyu. 5. Seidenki-ho (denkyoku-ho)). Text in Japanese. Osaka-fu Taiki Osen Boshi Gijutsu Shiryo (Data Preven. Air Pollut. Osaka Prefect.), no. 9:63-67, April 1973. 6 refs.*

The wet electrostatic method of odor removal is discussed. This method is especially useful for the removal of amines, dimethyl sulfide, and ethyl mercaptan. A cylindrical electrode is used with a central metallic wire, which acts as a counter-electrode. The application of 10-100 kV between these electrodes causes corona dischage to form around the wire electrode. The charged or ionized odorous materials are collected by the cylindrical electrode together with the mist. The gas washed with water prior to the electrode treatment, is cleaned of odorous components which are caught on the cylindrical electrode together with water and flow down the surface of the electode. The wet method is preferred to the dry method, because it is possible to continuously operate the machine. The rate of removal of odorous material varies largely with the state of corona discharge. The state of corona discharge depends upon the composition of the gas to be treated, the nature of the electrodes used, and the discharge current.

39222 **APTIC NO. 62357**

Mayazaki, Shuzo

COMBUSTION METHODS CONCERNING REDUCTION OF NITROGEN OXIDES. *(NOx teigen ni kansuru nenshoho). Text in Japanese. Preprint, Japan Petroleum Inst., Tokyo, p. 34-57, 1973. 11 refs. (Presented at the Japan Petroleum Institute Lecture Meeting on NOx Reduction, Tokyo, Japan, Aug. 29-30, 1973.)*

Nitrogen oxides formation mechanisms in combustion processes are discussed in relation to measures available for reduction of NOx formed during combustion of fuel. The main factors dominating formation of NOx during combustion are the concentrations of molecular nitrogen and oxygen, flame temperature, and residence time of the gas in the high-temperature zone. Therefore, such measures as lowering the flame temperature, (especially its peak temperature), reducing the residence time, or lowering the concentration of oxygen contained in the combustion gas should be effective. Measures to achieve these purposes are: improvement of the fuel-air feed/diffusion/mixing mechanism of a combustion equipment; increased thermal capacity of combustion gas achieved by addition of an inert substance such as exhaust gas, water, or steam to lower the flame temperature while retaining the same calorific value; shape of the flames to provide higher cooling efficiency (for example, a flat flame is much advantageous in this respect than a conical flame); increased heat absorption in the combustion chamber, selection of low-NOx burner; and combustion with low excess oxygen. The low-NOx burner was tested for performance, results are given in detail. Compared with a conventional burner, it reduces NOx by 40-50% with A heavy oil and 30-40% with C heavy oil. Another low-NOx burner is the self- circulation burner which is a double-stage combustion burner. Various aspects of its performance were also tested and the results are shown. It can reduce NOx by 25-30% with B heavy oil and 50-85% with a gas fuel.

39223 **APTIC NO. 61846**

Morita, Tomijiro

DESULFURIZATION OF SMOKE BY THE SODIUM SULFITE-GYPSUM METHOD. *(Aryuso-sekko-ho haien datsuryu). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), 26(12):315-320, Dec. 1973. 4 refs.*

Stimulated by the recent lack of gypsum in Japan and by the necessity of desulfurization of smoke, the title process was developed by the joint research of Kureha Chemical Industry Co., Ltd. and Mitsubishi Heavy Industries Co., Ltd. This process consists of 3 steps; absorption, regeneration, and oxidation. In the absorption process, the smoke containing sulfur oxides is brought into contact with alkali solutions containing sodium sulfite, which is supplied from the regeneration process. The tower used for this absorption is the same as that used for conventional desulfurization by sodium sulfite. In the regeneration process, the solution after absorption is allowed to undergo double decomposition by reaction with powdered limestone. The products of the reaction are sodium sulfite and calcium sulfite, which is solid. The former is used for the supply to the absorption tower. Calcium sulfite is oxidized to give gypsum. In the sodium sulfite solution, sodium sulfate gradually forms because of the oxidation of Na2SO3 by air. This Na2SO4 is treated with SO2 and CaSO3 to give gypsum and sodium hydrogen sulfite. The length of the long and short axes of gypsum particles made by the present method are 70-120 micron and 10-20 micron, respectively. The mechanical properties are also satisfactory for industrial applications. Estimates were made of the future demand for gypsum.

39224 **APTIC NO. 62763**

Morrall, James William

MEANS FOR PURIFYING THE EXHAUST DISCHARGE OF INTERNAL COMBUSTION ENGINES. *(Assignee not given.) Brit. Pat. 1,305,081. 6p., Jan. 31, 1973. (Appl. Feb. 21, 1970, 13 claims).*

A device for purifying the exhaust discharge of internal combustion engines is described. It consists of a heat retaining unglazed porous ceramic member in the path of the exhaust gases from an engine to heat them, mix them with a current of clean air, and thus oxidize them. The member was tapered with its narrow end toward the oncoming exhaust stream. It has a helical channel on its surface to guide the gas flow and lengthen its path of contact with the member. The device is preferably situated close to the engine as the efficiency of the oxidation increases with the higher operating temperature that the hot engine provides. At vehicle speeds greater than 45 mph the device is self-cleaning for burned residues are dried, crystallized, and blown out of the exhaust system.

39225 **APTIC NO. 62254**

Moss, G. and D. E. Tisdall

THE DESIGN, CONSTRUCTION, AND OPERATION OF THE ABINGDON FLUIDISED BED GASIFIER. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-1-1 to V-1-19. EPA-650/2-73-053. 2 refs. (Dec.)*

NTIS: PB 231977/AS

A detailed description is given of the design and construction of a desulfurizing fluidized bed gasifier used to remove sulfur dioxide produced during in situ partial combustion and gasification of fuel oil. The unit was operated for a total of 450 hr.

Information is presented on operational problems which were encountered and remedial steps which were taken. The internal configuration of the regenerator of the gasifier was identical with that of the batch units used in the exploratory phase. The gas was burned within a standard packaged boiler fitted with a suitably modified combustion system. A monolithic form of construction was used in which all vessels and transfer lines were formed as cored holes in a solid block of refractory concrete. Operational problems in the pilot plant were formation of lime/coke deposits in the ducting between the gasifier and the burner, a tendency to form too large a proportion of calcium sulfate within the regenerator, and poor containment of bed fines.

39226 **APTIC NO. 61921**

Nagata, K.

ON THE FORMATION AND CONTROLLING TECHNIQUES OF NITROGEN OXIDES EMISSION FROM FIXED COMBUSTION SYSTEMS. *(Kotei nensho sochi karano chissosankabutsu no hassei to yokusei gijutsu ni tsuite). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 111-135, 1973. 21 refs. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

A discussion is given on nitrogen oxides emission from fixed combustion systems and the formation mechanism of NOx. Furthermore, characteristics of various NOx emission controlling combustion techniques are described in detail and evaluated. In the measurements of fixed combustion systems in Tokyo area, the NOx emission of large power generation boilers was found to be 150 ppm (4% O2) for crude oil fuel, 205 ppm (4% O2) for heavy oil fuel, and 535 ppm (6% O2) for coal fuel. Thermal NOx controlling techniques can be divided into three distinct groups; techniques related to the modification of operation conditions, newly developed low NOx emission combustion, and fuel substitution. Control of NOx emission by modifications of operation conditions is usually performed through changes in the air-to-fuel ratio, change in mixing characteristics of the air-to- fuel ratio in the combustion chamber, lowering of the thermal load in the combustion chamber and lowering of the preheating temperature of air. Newly developed NOx reduction combustion techniques include modification of the burner and air register, exhaust gas recirculation, two-stage combustion, off-stoichiometric combustion, and injection of water or steam. The influence of the above thermal NOx controlling techniques on fuel NOx is also mentioned.

39227 **APTIC NO. 61930**

Narita, Shinichi

REDUCTION OF NITROGEN OXIDES IN EXHAUST GAS FROM STEAM POWER STATION. *(Chisso sankabutsu taisaku no sokushin to shomondai). Text in Japanese. Denki Kyokai Zasshi (J. Japan Elec. Assoc.), no. 595:45-54, May 1973.*

The concentration of nitrogen oxides in the exhaust gas from steam power station boilers was 270-960 ppm for combustion of coal, 210-510 ppm for a heavy oil-coal mixture, 102-240 ppm for heavy oil combustion by a boiler designed for a coal-heavy oil mixture, 178-560 ppm for heavy or raw oil combustion, and 165-210 ppm for gas, all before improvement of combustion methods. The nitrogen of NOx comes from nitrogen gas in air and from nitrogen compounds in the fuel, and since the production from the former sources is greatly reduced by lowering the oxygen concentration and/or lowering the combustion temperature there are a number of measures that can be taken to lower NOx production. These include low-air combustion, two-stage combustion, exhaust gas mixing, lowering the preheating temperature, jetting water or vapor, and improvements in the burner design. By adopting two-stage combustion, or exhaust gas mixing, NOx production was reduced by 20-30%. By a combination of these two measures it was reduced by about 40%. Since 30-50% of the nitrogen components of fuel are converted to NOx, the limits of NOx reduction in the case of coal may be 600 ppm. The combustion methods described above require stringent control of combustion conditions.

39228 **APTIC NO. 62344**

Nelson, P. A., E. C. Gay, R. K. Steunenberg, J. E. Battles, W. W. Schertz, D. R. Vissers, K. M. Myles, M. L. Klye, D. S. Webster, and L. Burris

DEVELOPMENT OF HIGH-SPECIFIC-ENERGY BATTERIES FOR ELECTRIC VEHICLES (PROGRESS REPORT). *Argonne National Lab., Argonne, Ill., Chemical Engineering Div., National Science Foundation, RANN Program, Rept. ANL-8039, 52p., Dec. 1973. 15 refs.*

NTIS: ANL-8039

The research efforts to develop a high specific energy lithum/sulfur battery having the performance characteristics required for powering pollution free automobiles are described. The cells have negative electrodes of molten Li and positive electrodes of S separated by a molten Li halide-containing electrolyte. The operating temperature of the cells is about 400 C. The performance goals for a single cell include a capacity density of 0.4 A-hr/sq cm at a current density of 0.1 A/sq cm, a peak power density of 1-2 W/sq cm, and a minimum cycle life of 1000 cycles. Cells with positive electrodes consisting of S-arsenic-carbon mixtures in graphite housings have achieved short time peak power densities and capacity densities that meet or exceed the goals for a single cell. The cell development program is supported by laboratory studies to investigate chemical reactions occurring in the cells and materials studies to identify materials of construction that are compatible with the cell environment and to design and fabricate cell components. (Author abstract modified)

39229 **APTIC NO. 62251**

Newby, R. A., D. L. Keairns, F. J. Vidt, D. H. Archer, and N. E. Weeks

FLUIDIZED-BED OIL GASIFICATION FOR CLEAN POWER GENERATION-- ATMOSPHERIC AND PRESSURIZED OPERATION. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-5-1 to IV-5-24, EPA 650/2-73-053. 6 refs. (Dec.)*

NTIS: PB 231977/AS

High sulfur residual oil gasification for the purpose of clean power generation is evaluated. Atmospheric pressure operation with conventional boilers and pressurized operation utilizing combined operation with conventional boilers and pressurized operation utilizing combined steam and gas turbine cycles are considered. The outlook and status of atmospheric pressure fluidized bed oil gasification is reviewed. The process was studied on a 1 MW pilot plant scale and was an effective pollution control device. Preliminary cost estimates for retrofit systems on conventional plants indicate a potential energy cost reduction of 30-50% over wet scrubbing or low sulfur fuel alternatives. A 30 to 100 MW demonstration plant is scheduled. A preliminary assessment is being carried out on fluidized bed oil gasification; plant performance, capital costs, and energy costs are being examined. The projected ability of the fluidized bed process to meet both pollution regulations and gas turbine requirements is discussed. Capital and energy costs for the pressurized fluid-bed combined cycle (PACE) plant process are compared with a conventional oil-fired plant with wet scrubbing, pressurized fluidized bed combustion of oil, PACE plant operation with No. 2 distillate fuel oil, and conventional pressurized oil gasification processes developed by Shell and Texaco. The fluidized bed process has the potential to reduce energy costs to more than 20% below a conventional plant with wet scrubbing and more than 15% below a PACE plant using distillate fuel oil. (Author abstract modified)

39230 **APTIC NO. 61717**

Nicklin, Thomas

IMPROVEMENTS IN OR RELATING TO TREATMENT OF WASTE GASES. *(British Gas Corp., London (England) Brit. Pat. 1,330,487. 5p., Sept. 19, 1973. (Appl. Oct. 27, 1970, 6 claims).*

A catalytic process for the treatment of waste gases and the recovery of sulfur from gases containing hydrogen sulfide is described. The gaseous mixture is contacted in a reactor vessel with a catalyst consisting of oxides of cobalt and molybdenum which causes hydrogen sulfide and sulfur dioxide to react together to yield sulfur. This process overcomes the defect in the Claus process by removing all of the SO2 and H2S and thus allows the effluent gas to be discharged into the atmosphere.

39231 **APTIC NO. 61739**

Nicklin, Thomas

TREATMENT OF GASES. *(British Gas Corp., London, England) Brit. Pat. 1,333,205. 7p., Oct. 10, 1973. (Appl. Jan. 29, 1970, 18 claims).*

A process for the removal of sulfur oxides from gases, particularly flue gases, and compositions for use in the process are described. The process consists of contacting the gas with a composition comprising an oxide of uranium, an oxide of thorium, and an oxide of an alkaline earth metal or an alkali metal preferably sodium oxide. The sulfur oxides present in the gas are sorbed on the surface of the composition. The three active constituents of the sorbing composition are preferably disposed on the surface of a carrier. Alpha-alumina is preferred as the carrier, but gamma-alumina, silica, natural clays, kaolin, powdered brick, silicon carbide, alkaline earth metal oxides, and molecular sieves may also be used. The carrier may suitably be shaped as small spheres or as hollow cylinders. The presence of oxygen in the gas serves to increase considerably the sorption of sulfur oxides. Generally there should be at least 1% by volume of oxygen present in the gas to be treated.

39232 **APTIC NO. 61740**

Nicklin, Thomas

IMPROVEMENT IN OR RELATING TO TREATMENT OF WASTE GASES. *(British Gas Corp., London (England)) Brit. Pat. 1,333,784. 5p., Oct. 17, 1973. (Appl. Oct. 27, 1970, 6 claims).*

A catalytic process for the recovery of sulfur from gases containing hydrogen sulfide is described. The gaseous mixture is contacted in a reactor vessel with a catalyst comprising oxides of nickel and uranium whereby hydrogen sulfide and sulfur dioxide are reacted together to yield S. This process is an improvement over the conventional Claus Kiln process which may leave intolerable concentrations of SO2 or H2S. Preferably the nickel and uranium oxides are disposed on a catalyst carrier. Bauxite, corundum, or active alumina is preferred as the carrier, but silica, kaolin, powdered brick, or an alkaline earth metal oxide or mixtures thereof may also be used. The proportion of nickel oxide present in the catalyst is preferably from 1% to 20%, more preferably 3% to 15% based on the weight of the metal in relation to the total weight of the catalyst including carrier. Uranium oxide is preferably present in an amount of from 2% to 15%, more preferably from 6% to 10% based on the weight of the metal in relation to the total weight of the catalyst including carrier.

39233 **APTIC NO. 62836**

Nicklin, Thomas and Peter Spence Clough

TREATMENT OF GASES. *(North Western Gas Board, Cheshire (England)) Brit. Pat. 1,307,875. 4p., Feb. 21, 1973. (Appl. June 10, 1970, 7 claims).*

A catalytic treatment for gases which removes sulfur compounds and recovers elemental S is described. Gases containing sulfur dioxide, hydrogen sulfide, carbonyl sulfide, and carbon disulfide are passed over a catalyst of molybdenum oxide and an oxide of thorium or uranium on alpha-alumina at a temperature in the range of 200-600 C to form H2S gas. This gas can be passed through a two-stage Claus process plant in which 1/5 of the catalyst in the second stage is replaced by the catalyst containing Mo and U or Th. The gas is then passed through a Stretford process plant for removal of the H2S. This gives an effluent gas with a greatly reduced S compound content which is suitable for direct discharge into the atmosphere.

39234 **APTIC NO. 61823**

Nishimoto, Korehiko, Shinjiro Suzuki, Torajiro Kurose, and Tadami Eto

SINTERING EXHAUST GAS TREATMENT METHOD. *(Shoketsuki haigasu shori hoho). Text in Japanese. (Mitsubishi Heavy Industries, Co., Ltd., Tokyo, Japan) Japan. Pat. Sho 49-14073, 3p., April 4, 1974. (Appl. May 28, 1968, 1 claim).*

This invention is designed to combine the sintering process and the treatment of sintering exhaust gas. Sintering material (mixture of particle sintering material and fuel mixture) is placed on an endless traveling grate and is ignited in the front part. Sintering is completed while moving. Under thy pallets for sintering material are two groups of wind boxes with independent settling chambers. The front group of wind boxes and the front settling chamber are connected with a gas pipe with a cyclone, and sintering gas is sent to the gas treatment system by a suction blower. The gas treatment system has spray nozzles, washer, and sulfur dioxide absorption tower. The gas from the front group of wind boxes is thus treated, then the cleaned gas is mixed with the gas from the wind boxes in the back of the sintering system, which has a relatively limited concentration of sulfur dioxide. The diluted gas reaches the safe emission standard and is emitted to the air through a stack.

39235 **APTIC NO. 62236**

O Neill, E. P., D. L. Keairns, and W. F. Kittle

KINETIC STUDIES RELATED TO THE USE OF LIMESTONE AND DOLOMITE AS SULFUR REMOVAL AGENTS IN FUEL PROCESSING. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p 1-6-1 to 1-6-14, EPA-650/2-73- 053, 11 refs. (Dec.)*

NTIS: PB 231977/AS

A pressurized thermogravimetric analysis system adapted to handle corrosive gases was used to obtain sulfur removal and regeneration data for limestone and dolomite. The kinetic feasibility of the desulfurization processes proposed for fluidized bed gasification and combustion was demonstrated at 10 atm. Calcium carbonate could be regenerated for gasification processes. Regeneration for the combustion system requires further study. The rates of reaction and chemical reactions for desulfurization and regeneration are presented. High stone utilization (greater than 70%) was achieved within 30 min for removal of sulfur dioxide and hydrogen sulfide. During regeneration of calcium sulfate by the two-step, low temperature process, calcium sulfate was reduced to calcium sulfide with more than 90% efficiency. Less than 30% calcium carbonate was regenerated from sulfide at practical temperatures. Calcium carbonate was regenerated from calcium sulfide produced from H2S (70% regeneration in 15 min). Calcium sulfide was oxidized (90%) to calcium sulfate using dolomite. (Author abstract modified)

39236 **APTIC NO. 61950**

Oberdorfer, Paul Ellsworth

MOTOR VEHICLE EMISSION CONTROL SYSTEM. (Sun Oil Co., Philadelphia, Pa.) Brit. Pat. 1,334,388. 7p., Oct. 17, 1973. (Appl. Dec. 17, 1970, 10 claims).

A system for reducing the pollutants contained in the exhaust of a motor vehicle internal combustion engine using a fossil fuel is described. The fuel air mixture fed to the intake of the engine is enriched during off idle and low flow main metering operating conditions. The enrichment reduces the nitrogen oxides emissions from the engine. The fuel air mixture fed to the engine intake is automatically enleaned at speeds at or above a preselected speed and under non-closed throttle conditions. At least a part of the carbon monoxide and hydrocarbons contained in the effluent are converted to harmless substances by a thermal reactor.

39237 **APTIC NO. 61736**

Odds, David John Harland

GAS SCRUBBER. *(Hughes F. A. and Co., Ltd., Surrey (England)) Brit. Pat. 1,333,877. 7p., Oct. 17, 1973. (Appl. Feb. 12, 1971, 19 claims).*

A gas scrubber is described which is particularly applicable in the treatment of flue gas from marine oil tanker boilers. The scrubbing tower has generally horizontally extending trays which extend across the tower and are formed of one or more pairs of identical plates. In each plate, there is a row of apertures which are offset to one side of the center line of the plate so that one edge of each plate is spaced a greater distance from the row of apertures than the opposite edge. The trays and the associated caps of the tower are preferably formed from a plastic material such as polypropylene.

39238 **APTIC NO. 62714**

Ortegren, L. G.

DEVELOPMENT OF STIRLING ENGINES IN SWEDEN: REVIEW OF RECENT PROGRESS AND CURRENT ACTIVITIES. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 34-56. (Oct. 14-19.)*

Several prototype displacer Stirling engines were tested and then a double acting type Stirling engine was developed. Work is also proceeding on one-cycle, two-cylinder engines for auxiliary systems, engines with indirect heat supply utilizing heat pipe technology, and engines with unconventional heating systems for underwater vehicle applications. The major components and design of the double acting V-4 engine are discussed in detail, and drawings are given. Two basic control concepts for Stirling engines are illustrated: mean pressure control and pressure amplitude or dead volume control. The heat pipe concept increases efficiency, power, and choice of heat source and decreases exhaust emissions through heat exchange. Even without exhaust gas recirculation, the emissions are below the standards except for nitrogen oxide which is only 50% above the very stringent 0.4 g/mi standard. Exhaust gas recirculation tests indicate that NOx levels of about 0.2 g/mi will be achieved with an insignificant loss of efficiency. Efficiencies of alternative heavy/medium duty engines, weight-to-power ratios for alternative heavy/medium duty engines, and noise-generating mechanisms of diesel and Stirling engines are compared.

39239 **APTIC NO. 62169**

Orth, Karl-Heinz

HEATING POWER PLANT AND ENVIRONMENTAL PROTECTION. CLEANER AIR DUE TO OPTIMIZED COMBUSTION CONDITIONS FOR HEAVY FUEL OIL. *(Heizkraftwerk und Umweltschutz. Reinere Luft durch optimale Verbrennung bei Schweroelbetrieb). Text in German. Fernwaerme Int., 2(6):153-162, Dec. 1973. 16 refs.*

Studies on the conditions of sulfur dioxide, sulfur trioxide, nitric oxide, and nitrogen dioxide formation in heating power plants fired with heavy fuel oil are reviewed, and possibilities of emission abatement and corrosion protection in such firing equipment are described. At temperatures below the water vapor dew point, the water vapor formed in the flue gases combines with SO2 to form sulfurous acid, while SO3, formed from SO2 with molecular oxygen and with atomic oxygen in the flame zone, forms more aggressive sulfuric acid with water vapor. The rate of SO3 formation in the flame zone is negligible due to the short hold time there. The acid dew point is practically unaffected by the fuel sulfur content at low air excess coefficients around 0.5%, while the fuel suflur content becomes a determining factor of the acid dew point at an air excess coefficient of 20%. The rate of SO3 formation is consequently determined mainly by the air excess coefficient. With lowering oxygen content in the flue gases, the acid dew point approaches the water vapor dew point. Reduction of the rate of SO3 formation with decreasing boiler load was observed. Nitric oxide, formed at high temperatures with molecular oxygen, may produce ozone with which it oxidizes to NO2. Adequate oil viscosity, fine atomization of the fuel, and controlled secondary air supply are essential for combustion at low air excess coefficients. While the formation of SO3 can be intensified by catalysts present in the slag, such as of vanadium, it can be reduced by the addition of such additives as dolomite, magnesia, silica, zinc oxide, or ammonia.

39240 **APTIC NO. 62642**

Pagni, P. J., L. Hughes, and T. Novakov

SMOKE SUPPRESSANT ADDITIVE EFFECTS ON PARTICULATE EMISSIONS FROM GAS TURBINE COMBUSTORS. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ Panel Meet., London, England, 1973, AGARD-CP-125, p. 28-1-28-11. 37 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The effects of manganese-based additives on the mass, size distribution, and chemical composition of particulate emissions from gas turbine combustors are described. The additive, 2-methylcyclopentadienyl manganese tricarbonyl, can increase mass emissions if used excessively. The additive shifts the emitted particle size distribution toward much smaller particles, thereby reducing visibility primarily by reducing the size of the emitted particles. X-ray photoelectron spectroscopy studies have determined that the chemical state of the emitted manganese is manganese monoxide. The additives were evaluated for smoke reduction, solubility, availability, and fuel system performance. However, their long-term effect on the environment is a cause for concern. It is not clear whether metal-based additives actually reduce total carbon particulate mass emission or simply redistribute particle sizes to reduce their visibility while forming metal oxides which are themselves pollutants. Future utilization may be limited by concern for their role in creating pollutants. Combustor redesign and collection techniques should be employed whenever possible to suppress particulate emissions from aircraft and test facilities. (Author abstract modified)

39241 **APTIC NO. 61951**

Palumbo, Pete

APPARATUS FOR AND METHOD OF COLLECTING SMOKE FROM COKE OVENS DURING CHARGING. *(USS Engineers and Consultants, Inc., Pittsburgh, Pa.) Brit. Pat. 1,334,546. 6p., Oct. 17, 1973. (Appl. Nov. 20, 1970, 19 claims).*

A method and apparatus for the smokeless charging of an oven at high temperature with coal at a lower temperature than the oven are described. The system prevents the escape of charging gas and oven gas through the hopper of the larry car and the drop sleeves on the hopper to the atmosphere. Air pollution is substantially eliminated during the charging of a coke oven with coal at a lower temperature than the temperature of the oven. Overloading of the exhaust aperture of the oven with evolved charging gas and displaced oven gas during the charging operation is prevented. Extensive exhaust systems are provided.

39242 **APTIC NO. 62738**

Pangborn, Jon

ALTERNATIVE FUELS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 252-255. (Oct. 14-19.)*

Two research programs are reviewed which are trying to identify the most promising domestic, nonpetroleum derived fuels which would permit a reduction in the automotive use of petroleum while providing acceptable performance, emissions, and economies. In one study, background information on energy, material resources and conversion, fuel properties and combustion characteristics, and fuel-engine-vehicle requirements and compatibility is being gathered. In the second phase of the project technical and economic criteria and procedures are selected including costs, demands for fuels, environmental constraints, and technological readiness. Then a detailed assessment of the fuel candidates is made considering their sources, storage, efficiency, environmental effects, technological readiness, and other characteristics. Finally, recommendations and scenarios are made.

39243 **APTIC NO. 62441**

Papayannopoulos, Andrew G.

THE NEW GASOLINE AND AIR POLLUTION CONTROL. *Tech. Chron., (Athens), 11(569):1018-1022, 1973, 20 refs.*

To eliminate pollutants from automobile exhausts, catalytic converters will be used on all new cars after 1975. This will require the use of a new gasoline, since the present gasoline is unsuitable because of the lead antiknock/octane boosting compound in it which poisons catalysts. In addition, lead combustion products are another pollutant. Thus, the new gasoline must be without lead and have proper volatility to insure satisfactory performance of the automobile catalytic converter system. Many nations are establishing strict laws and regulations on air pollution, and the U. S. has the strictest laws and regulations. The banning of lead from the new gasoline poses the problem of how to boost the octane number of the unfinished fuel. Of the methods studied, upgrading through reforming, alkylation, or isomerization appears the best. The use of manganese antiknock compounds appears to be technically sound, but economically unattractive. The cost of converting to the new gasoline will be several billion dollars. Some changes in the metallurgy of some parts of the engine will be necessary. New electronic ignition systems, and in some cases, redesigning of the engine itself, will be needed. (Author summary modified)

39244 **APTIC NO. 62026**

Petersen, Helge Hogh

ELECTROSTATIC DUST PRECIPITATOR. *(F. L. Smidth and Co., Copenhagen, Denmark) Brit. Pat. 1,330,612. 7p., Sept. 19, 1973. (Appl. Feb. 18, 1972, 9 claims).*

An electrostatic dust precipitator which can be used for dedusting smoke in a manufacturing plant is described. It has at least one collecting electrode with a rapping mechanism made of at least one tumbling hammer that rotates about a horizontal shaft so that is repeatedly swings down in a free pendular movement until a flat impact of the hammer strikes against a rounded anvil centrally mounted at the end of a rapping bar which is thus moved axially to jar the electrode. The bar is urged by the weight of the electrode which is eccentrically mounted to a rest position in which the impact surface of the hammer is, at the moment of impact, perpendicular to the axis of the rapping bar and the distance from the center of rotation of the tumbling hammer to its point of impact with the anvil at the end of the rapping bar substantially equal to the radius of gyration of the hammer. Unlike other precipitators, the mechanical stress of the structure is very gentle and at the same time the whole impact is transmitted in the form of a vibration of the collecting electrodes without being lost in deformations of the structural parts.

39245 **APTIC NO. 61805**

Petroll, Joachim

RESULTS OF RECENT STUDIES OF ELECTROSTATIC PRECIPITATORS. *(Ergebnisse neuerer Untersuchungen an Elektroabscheidern). Text in German. Preprint, 17p., 1973. 8 refs. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, East Germany, June 28, 1973.)*

Some problems of calculating, planning, and optimizing electrostatic precipitators are dealt with. A theoretically and experimentally determined function (X) of the most important factors influencing the electric collection efficiency forms the basis of calculating electrostatic precipitators. The function X represents more completely all influencing factors than the approximation of the exponential equation derived by Deutsch which is generally used. For determining the function X, certain connections between the influencing parameters must be known. This is primarily true for the dependence of the ionizing current density and for the maximally achievable ionizing current density on certain parameters of the gas, the dust, and the precipitator. By means of three practical examples, namely the combination of a cyclone with an electrostatic precipitator, the changes of the waste gas conditions behind cement mills through application of auxiliary agents, and the electrostatic dust collection at high temperatures, all factors influencing the costs and optimal design of an electrostatic precipitator are outlined.

39246 **APTIC NO. 62351**

Pietsch, W.

BRIQUETTING AS A CONTRIBUTION TO ENVIRONMENTAL PROTECTION BY THE RECOVERY OF FILTER DUST AND ORE DUST IN METALLURGICAL PLANTS. *(Anwendung der Brikettierung im Umweltschutz am Beispiel der Rueckfuehrung von Filter-und Erzstaeuben in metallurgischen Anlagen). Text in German. Aufbereitungs Technik, 14(12):818-821, 1973.*

Many industries face the problem of disposing of large quantities of fine solids separated in dust collectors. Apart from a number of specific problems caused by the large specific surface of the dust, the major problem is the danger of renewed (secondary) pollution of air and water as long as the solids are finely distributed. If methods for increasing the grain size are applied to agglomerate the finely dispersed material, economic processes can be developed to recycle the solids and to recover valuable substances. Methods of this kind often not only finance the capital investment spent for environmental protection but even yield significant profit. This is particularly true of pressure- type agglomeration directly producing briquettes having a stability that allows their being recycled into the process. In a plant for the manufacture of iron-nickel, lateritic nickel ore is preliminarily reduced in a rotary kiln with lignite as a solid reduction agent. This process develops large quantities of dust. The dust contains up to 30% usable carbon and up to 70% ore. The coarse dust particles (about 60 to 70%) are retained in a multicyclone while the fine dust is separated in venturi scrubbers. In the plant for recovery of the dust the dry and wet dusts are mixed with 20 to 30% dry nickel ore dust from electrostatic precipitators. A mixture of 63% filter dust, 30% nickel ore dust, and 7% water is obtained which is pressed to almond-shaped briquettes. The briquettes are added to the furnace charge which raises the dust emission by about 30 to 40%. The filters must be designed accordingly.

39247 **APTIC NO. 62724**

Platell, Ove

CRITICAL COMPONENTS FOR AUTOMOTIVE RANKINE SYSTEMS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 161-171. (Oct. 14-19.)*

A steam power project for automobile engines is described, and because of the air pollution problem, Rankine system development has received extra emphasis. The philosophy of the system and problems with the system are reviewed. The projected engine uses water as the working medium which is hermetically sealed, a 9-cylinder wobbleplate piston engine directly connected to differential, multi-microtubes in parallel arrangement in the steam generator, a condenser buffer for peak loads, an air-cooled condenser with extremely small hydraulic diameters, an auxiliary system driven by a separate constant speed steam engine, and thermal insulation to avoid freezing.

39248 **APTIC NO. 61968**

Platou, J. S.

ELEMENTAL SULFUR - PROBLEMS AND OPPORTUNITIES. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 235-244, (Oct. 31.)*

Several of the more advanced stack gas scrubbing systems and of the proposed coal gasification processes recover elemental sulfur. Elemental sulfur is relatively innocuous, easily stores, and is apparently readily marketable. Some of the fundamentals of storing, marketing, and transporting elemental sulfur are reviewed. Vatted sulfur can cause dust when it is broken up and handled; remelting or flaking the sulfur pose less of a dust problem, but would add to production costs. The decision to handle and market the recovered sulfur as a liquid, solid, or both would have to be determined after considering the marketing, environmental, and economic situation for each case. The current sulfur supply/demand situation is examined. Although U. S. supply/demand is balanced, Canada is storing coal recovered from natural gas. Future supply/demand estimates show that sulfur from existing sources is more than adequate to meet demands in traditional sulfur-consuming industries in 1985. Thus, sulfur from sulfur recovery plants will cause an oversupply by 1985. Alternatives would be to stockpile sulfur or to create and develop new uses for sulfur. The latter alternative has very good possibilities. Sulfur-asphalt paving materials, sulfur concretes, surface-bond concrete blocks with a sulfur formulation, sulfur as a coating material, and other potential uses may provide the necessary new markets for sulfur. However, it will be necessary to develop these new uses to meet the expected increase in sulfur supply.

39249 **APTIC NO. 62655**

Plungis, Donald

EVALUATION OF DANA RETRONOX EGR AND UOP OXIDIZING CATALYST RETROFITS ON TWO MEDIUM DUTY VEHICLES. *Office of Air and Water Programs, Washington, D. C., Emission Control Technology Div., Rept. 74-10 DWP, 10p., Sept. 1973.*

The evaluation of the Dana Retroxox EGR (exhaust gas recirculation) and UOP oxidizing catalyst retrofits on two medium duty vehicles is described. The recirculation system and catalyst were retrofitted to both a 1972 Chevrolet 3/4 ton pick up truck with a 350 CID engine and automatic transmission, and a 1972 Dodge stake truck with a 318 CID engine and standard transmission. The system employs an engine speed and ported carburetor vacuum controlled EGR system, and an engine speed controlled vacuum advance cut off system. Both EGR and relative spark timing retard are effective in reduction of total nitrogen oxides. Both trucks were retroffited with UOP pellet type, noble metal oxidizing catalysts. At low mileage a minimum of 80% reduction in hydrocarbon and carbon monoxide emissions was achieved with a minimum 40% reduction in nitrogen oxides.

39250 **APTIC NO. 62656**

Plungis, Donald

EVALUATION OF ENGINEERING LUBRICANTS SYSTEMS CORPORATION S VAL-DO COMBUSTION CLEANER AND POWER LUBE FUEL ADDITIVES. *Office of Air and Water Programs, Washington, D. C., Emission Control Technology Div., Rept. 74-11 DWP, 6p., Sept. 1973.*

The evaluation of Engineering Lubricants Systems Corp. Val Do Combustor Cleaner and Power Lube Fuel additives is described. Test work was conducted on a 1963 Chevrolet with a standard transmission and a 1962 Chevrolet with an automatic transmission. Both vehicles were powered by 283 CID engines. There was a marked increase in compression pressure immediately following application of the cleaner, but there was no longer an effect after 500 mi of driving. No marked emission reduction is apparent when hydrocarbons, carbon monoxide, and nitrogen oxides are measured. Limited heated flame ignition detector work suggests that the fuel additive may contribute a heavy hydrocarbon exhaust component. The application of the Combustion Cleaner created objectionable visual white smoke for at least 10 min after application.

39251 **APTIC NO. 62731**

Plungis, Donald

HONDA CVCC VEHICLE TESTS. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 209-214. (Oct. 14-19.)*

The Honda Compound Vortex Controlled Combustion (CVCC) System is described. It uses a pre-chamber into which a rich mixture of fuel and air is carbureted. This requires a second intake valve. A lean mixture is carbureted into the main combustion chamber. Combustion is initiated by a spark plug in the pre-chamber. Three Honda Civic vehicles and a heavier vehicle without catalysts, air injection pumps, thermal reactors, or exhaust gas recirculation met 1976 interim standards for hydrocarbons, nitrogen oxides, and carbon monoxide. The average emissions for the Honda Civics were .18, .23, and .24 g/mi HC; 2.2, 1.75, and 2.0 g/mi CO; 0.89, 0.65, and 1.03 g/mi NOx. In tests with and without exhaust gas recirculation, the 1976 standards were achieved with a penalty in fuel economy. Fuel economy was equivalent to 1973 vehicles (about 10 mpg for a 5000 lb vehicle) of similar weight and displacement.

39252 **APTIC NO. 61673**

Puschmann, G.

ODOR PROBLEMS IN A SULFATE PULP PLANT. *(Das Geruchsproblem einer Sulfatzellstoffabrik). Text in German. Associazione Tecnica Italiana per la Cellulosa e la Carta and Food and Agricolture organization, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, Italy, 1973. May 7-11, p. 591-597.*

A process applied at the Nettingsdorf kraft mill in Austria for the deodorization of kraft process-generated malodorous emissions containing hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, is described. The malodorous waste gases from the digester, the condensate, the evaporator, and the liquor boiler are collected via a storage tank without admission of air to prevent explosion hazards. The waste gases collected are burned by means of special burners by the addition of air without auxiliary fuel. The combustion gases from a sulfur furnace, operated at 1100 C, are cooled and led through an absorption column where the gaseous components are adsorbed by sodium carbonate. Complete oxidation of the malodorous substances was noted. The condensate is purified by blowing with steam. The noncondensed fraction, composed mainly of malodorous substances, is led to the gas burner of the sulfur furnace together with the evaporator waste gases.

39253 **APTIC NO. 62646**

Quillevere, Alain, Raymond Briancon, and Jean Decouflet

THE STANDPOINT OF ENGINE DESIGNERS REGARDING THE CONCEPT OF LESS-POLLUTING COMBUSTION CHAMBERS. *(Point de vue du motoriste sur la conception des foyers a faible taux de pollution). Text in French. North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 32-1-32-19. 14 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The mechanisms of the formation of air pollutants, such as carbon monoxide, nitrogen oxides, unburnt hydrocarbons, and carbon particles in conventional and supersonic turboreactors, and design possibilities for their abatement are discussed. Carbon monoxide and unburnt hydrocarbon emissions are predominant during taxiing, while the particulate and nitrogen oxides emissions are dominant during take-off, ascension, and cruising. The systematic use of annular combustion chambers has resulted in considerable reduction of the unburned hydrocarbon and CO emissions at idle, and improved injection techniques facilitating partial premixing have resulted in the abatement of visible smoke. The nitrogen oxides emissions, conditioned especially by high compression ratios and high supersonic speeds, can be theoretically abated by water injection (this, however, is not practicable during cruising). The afterburning chamber of the Olympus turboreactor used in the Concorde produces no nitrogen oxides and particulate matter due to the relatively low temperature. However, constant transformation of part of the nitric oxide into nitrogen dioxide was observed.

39254 **APTIC NO. 62730**

Raggio, David G.

U. S. ARMY TANK AUTOMOTIVE PROGRAM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 204-209. (Oct. 14-19.)*

In the past, five stratified hybrid combustion systems were investigated to find a system which had the light-weight features of a gasoline engine and the fuel economy of a diesel engine. A new research program has continued this research to develop an engine which would satisfy emission requirements and have a multifuel capability. The effect of unleaded gasoline + 2% oil, jet fuel, middle distillate, and diesel fuel on hydrocarbon, carbon monoxide, and nitrogen oxide emissions and on fuel economy is described. The fuel effect on fuel economy at different speeds is listed. Emissions and performance comparison with various degrees of emission control are also listed.

39255 **APTIC NO. 62240**

Rice, R. L. and N. H. Coates

COMBUSTION OF COALS IN FLUIDIZED BEDS OF LIMESTONE. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd. 1973, p. I-3-1 to I-3-13, EPA-650/2-73-053. 1 ref. (Dec.)*

NTIS: PB 231977/AS

Various coals were tested as fuel in fluidized beds of limestone to compare sulfur retention and to measure heat transfer with tubes immersed in the bed. Five types of bituminous coal were tested from high volatile A to low volatile, which varied in ash content from 8 to 24% and in sulfur content from 2 to 4%. As a fluidizing velocity of 3 ft/sec and when fines from the primary cyclone were recycled to the bed, S retention by a limestone bed increased rapidly to 90% as calcium/S increased to approximately 2. At 6 ft/sec and without recycle, the Ca/S had to be at least 3 to retain 90% of the S in the bed. Carbon burnup was too low for commercial boiler operation when recycle was not employed, regardless of the fluidizing velocity. Even when recycle was used at the lower velocity of 3 ft/sec, carbon burnup might not be commercially acceptable so that a separate burnup cell would be required. At 3 ft/sec fluidizing velocity, using beds ranging in size from 8 by 28 mesh to 3/8 by 3/16 inch, the heat transfer coefficient from the bed to a tube immersed in the bed was 60 to 70 Btu/hr/sq ft-F. At a velocity of 6 ft/sec and with beds of 1/4 by 3/16 inch particles, the coefficients to steam-cooled and water-cooled tubes were 43 and 32, respectively. (Author conclusions modified)

39256 **APTIC NO. 62778**

Robertson, William McArthur

IMPROVEMENTS IN OR RELATING TO THE REMOVAL OF MERCAPTANS FROM A GAS. *(Clensol Ltd., Essex (England)) Brit. Pat. 1,310,281. 5p., March 14, 1973. (Appl. June 9, 1970, 8 claims).*

A method of removing mercaptans from a gas is described in which the gas is passed through benzene or a homologue and an alkali solution. The mixture is circulated through a scrubbing tower at 30 gal/min, entering through a spray head, and forming four layers (aqueous, alkali, xylene-alkali emulsion, and xylene) at the bottom of the tower. After passing through the layers and the tower at 8 cu ft/min, the gas is odorless and its mercaptan content decreased from more than 100 ppm to less than 2 ppm. This process enables storage vessels for liquefied petroleum gas which contain a mercaptan to be purified and meet the Code of Practice of the Liquified Petroleum Gas Industry Technical Committee.

39257 **APTIC NO. 62252**

Robson, F. L.

FUEL GASIFICATION AND ADVANCED POWER CYCLES--A ROUTE TO CLEAN POWER. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. IV-6-1 to IV-6-18, EPA-650/2-73-053. 5 refs. (Dec.)*

NTIS: PB 231977/AS

A fuel gasification/desulfurization system, the Combined Gas and Steam (COGAS) system, is reviewed. Advantages and disadvantages of the system are discussed. This system could attain an efficiency nearly 50% greater than other current systems. An integrated power system/fuel processing system must consider several environmental constraints, such as sulfur and particulate removal within the gasifier and nitrogen oxide formation; problems must be solved before the overall concept becomes a commercially viable one. Current emission standards are based upon the amount and type of fuel burned. If the full advantage is to be taken of the advanced power systems, a new basis for standards must be used. Standards based on emissions/MWhr would be a more reasonable choice.

39258 ***APTIC NO. 61721***

Romell, Dag

REMOVAL OF DUST FROM GASES. *(Assignee not given.) Brit. Pat. 1,331,466. 5p., Sept. 26, 1973. (Appl. Sept. 29, 1970, 5 claims).*

A process for the removal of dust from gases which uses an electrofilter is described. The dust particles are supplied with an electric charge before the gas is passed through an electrofilter. Droplets of a liquid which is evaporable under the conditions prevailing in the gas are injected into the gas upstream of the electrofilter. The droplets are supplied with an electric charge and are then exposed to evaporation in a gas flow passage extending between a location where the droplets have been supplied with an electric charge. The electrofilter causes the droplets to diminish in size by progressive evaporation. They transfer their charge to the dust particles and the gas containing the charged dust particles is passed through the electrofilter.

39259 **APTIC NO. 61969**

Rosenberg, Harvey

ADVANCES IN DISPOSAL OF SODIUM-BASED WASTES FROM STACK GAS DESULFURIZATION PROCESSES. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 281-303. (Oct. 31.)*

The disposal of sodium-based wastes from stack gas desulfurization processes is reviewed. Although there are a number of techniques available for disposing of these wastes, thus far, only direct dumping in specialized situations has been practiced on a commercial scale. New approaches to sodium-sulfur oxide disposal include aqueous coprecipitation (Fersona) and sintering mixed sulfate-fly ash wastes (Sinterna). Both processes reduce the solubility of sodium-sulfur oxide wastes to less than that of calcium sulfate without sludge handling problems. The precipitates or sintered pellets are amenable to simple open landfill disposal, and the pellets may be useful as aggregates. These processes represent a potential solution to the major difficulty associated with throwaway sodium alkali systems for sulfur oxide control -- disposal of the waste effluent. Therefore, a simple, reliable sodium alkali throwaway system may be the answer to the sulfur dioxide control problem in many cases. Other disposal methods for sodium salts are discussed including direct dumping, direct landfill in clay isolation cells, regeneration with limestone and/or lime, and use as a raw material. (Author conclusions modified)

39260 **APTIC NO. 59833**

Ross, Samuel Scott

EXHAUST CLEANER. *(Assignee not given.) U. S. Pat. 3,744,221. 7p., July 10, 1973. 5 refs. (Appl. Nov. 26, 1971, 6 claims).*

An exhaust cleaner consisting of a baffle precleaner coupled to a steam scrubber for the removal of particulate matter from gas streams has been developed to overcome limitations of prior art devices by having the flexibility to employ a cyclone to increase potential particle-contacting area and by having provision for returning a portion of the heated gases to the heating source. Separation of extremely small particulates is possible since the device may include a scrubber employing liquid vapor dispensing. The baffle precleaner includes a baffle filter, several filter screens, and a duct and blower at its lowermost end for return of heated separated gases to the source. Small particulate aerosols are introduced through a duct to the steam scrubber where the particulate matter acts to form a nucleus about which water vapor may condense and be carried toward the bottom of the scrubber.

39261 **APTIC NO. 61895**

Saiki, K., H. Shibahara, H. Inoue, and H. Oshima

REACTIONS OVER ALUMINUM-IRON ALLOY-NOBLE METAL CATALYSTS-OXIDATION OF CO AND REDUCTION OF NO. *(Aruminiumu tetsu gokin-kikinzoku shokubai niyoru hanno-CO no sanka oyobi NO no kangen). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 130-131, 1973. 1 ref. (Presented at the Symposium on Catalysis, 33rd, Hiroshima, Japan, Oct. 19-11, 1973, Paper 1X04.)*

Aluminum-iron alloys were prepared by either dipping an iron plate into a molten aluminum bath or by coating a stainless steel net with aluminum paint heating 900 C. Palladium was incorporated onto these alloys using a palladium chloride solution. Oxidation of carbon monoxide and reduction of nitric oxide were studied over these catalysts. A 140 sq cm (4g) of stainless steel net carrying 3.1 g Pd/sq m converted 50% of CO at 250 C and 80% at 260 C, while a 70 sq cm (26g) of an iron plate carrying 1.65 g Pd/sq m converted 50% of CO at 350 C and 80% at 390 C. Formation of FeAl3 or Fe2Al5 on the stainless steel net was confirmed by X-ray diffraction. All the catalysts thus prepared did not show any degradation when heated at 800 C, while a commercial platinum-alumina catalyst showed considerable degradation at 800 C. The catalyst also showed activity in reduction of NO by CO and NO removal efficiency of higher than 98% was maintained longer than 20 hr at 450 C, but the presence of 10 ppm SO2 lowered the activity by 1/2. Application of the catalyst to a catalytic converter for automobile exhaust emission was successful. Two hundred g of the catalyst containing 3.1 g Pd/sq m was required for a 1260 cc engine to remove CO and hydrocarbons when unleaded gasoline was used.

39262 **APTIC NO. 61630**

Santiago, Andres and Enrique Santiago

CATALYTIC EXHAUST GAS PURIFIER FOR COMBUSTION ENGINES. *(Vorrichutung zur katalytischen Reinigung der Auspuffgase von Brennkraftmaschinen). Text in German. (Zeuna-Starker KG, Augsburg (West Germany)) W. Ger. Pat. Appl. 2,213,539. 4p., Oct. 4, 1973. 4 refs. (7 claims).*

An impact-proof catalytic exhaust purifier for internal combustion engine exhaust gases with a gas-tight seal between the catalyst support and the casing is described. The catalyst body is enclosed within a protective envelope and is carried in a metal housing between inwardly-directed flanges by one or more sealing rings in a resilient, non-combustible material positioned on the outer periphery of the envelope. The rings consist of compressed mineral fibers and overlap the extremeties of the catalyst body.

39263 **APTIC NO. 61803**

Schmidt, Fred and Wilhelm Jugel

DUST COLLECTION IN THE FLUIDIZED BED. *(Staubabscheidung in der Wirbelschicht). Text in German. Preprint, 10p., 1973. 2 refs. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, East Germany, June 27-28, 1973.)*

Dust collection in the fluidized bed has become increasingly more interesting. The dust is retained by contacting suspended moving particles which for better efficiency are constantly wetted. It is of advantage to use electrostatically charged particles in the fludized bed for dust retention. The process can be conducted discontinuously, quasicontinuously, and continuously. With the first two methods, a certain quantity of contact material is used for a certain period of time and then replaced or regenerated. With the continuous method, dust-laden contact material is drawn off continuously and fresh enters so that the process is never interrupted. Some tests with continuous operation using quartz sand with grain sizes between 0 and 60 micron yielded a collection efficiency of

98% with a dust load of 2 g/cu m. Most of the experiments were conducted at discontinuous operation. As a best result, a collection efficiency of 99% could be achieved for more than 135 min at a load of 5 g/cu m. With higher suspended layer, the lifetime increases and with it the collection efficiency. However, the pressure loss rises. Depending on the test conditions, pressure losses of 80 to 400 mm water were measured. The pressure loss increase with the velocity is negligible once the contact material is in motion and suspended which permits the increase of the gas throughput without additional efforts. Tests without wetting of the contact material brought unsatisfactory results. The collection efficiency was 40% at the most. The suspended matter influences the collection efficiency through particle size and shape.

39264 **APTIC NO. 62747**

Schulz, Robert

STATUS REPORT ON HAZARDS OF NICKEL OXIDE. OCTOBER 12, 1973. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. F-1-F-3. (Oct. 14-19.)*

A study of the toxicity and carcinogenic hazard from gas turbine engine exhaust due to nickel oxide regenerator rubbing seal particles is reviewed. Engine exhaust particulate levels as large as the current threshold limit value for nickel of 1000 micrograms/cu m could result. Nickel oxide can produce muscle sarcomas when injected into rats, may act as a cocarcinogen in the lungs, may cause histological changes in bronchi and alveoli, is cleared relatively slowly from the respiratory tract, and can cause nasal and lung cancer in nickel workers. A prototype vehicle tested for total particulates and NiO gave results of 0.68 and 0.0034, respectively, for the Federal Driving Cycle Cold Start test procedure, of 0.29 and 0.0025 for the FDC Hot Start, of 0.27 and 0.0020 for the FDC Hot Start, and of 0.14 and 0.0005 for the 50 mph Steady State procedure. More research is necessary on the increase in urban ambient levels of nickel due to NiO seals.

39265 **APTIC NO. 62136**

Schwartz Reinhard, Gerhard Stumpp, and Heinrich Knapp

K-JETRONIC - CONTINUOUS GASOLINE INJECTION BY BOSCH. PARTS I AND II. *(K-Jetronic - kontinuierliche Benzineinspritzung von Bosch Teil 1 und 2). Text in German. Automobiltech. Z. (Stuttgart), 75(11):393-398, Nov. 1973. 8 refs.*

The K-jetronic is a mechanical injection system which continuously distributes the gasoline, dosed according to a linearly operating air quantity meter, to the injection valves. Through the linear properties of both the air quantity meter and the gasoline dosing device, as well as through their combination by means of a single lever to a mixture control, an accurate and stable basic adjustment for a constant fuel-to-air ratio is obtained. A description of the operating principle of the individual elements of the injection system is given. In part two the design of the various aggregates is described. The K-jetronic mixture control is installed ahead of the throttle valve in flow direction of the intake air. It is suspended horizontally and no higher acceleration than 5 g may act on it. The injection valves are installed as close as possible to the engine inlet valves. The K-jetronic was adapted to a larger number of engines for which five different methods of installation were used. The exhaust gas emission of K-jetronic equipped engines with four and six cylinders was determined by the CVS (constant volume sampler) test. The CO emissions measured from 11.2 to 22.7 g/mile, the hydrocarbon emissions from 1.6 to 2.18 g/mile and were well below the 1973 limits values of 39.0 (CO) and 3.4 (HC) g/mile. The emissions for nitrogen oxides ranged from 1.76 to 4 g/mile with the 1973 limit value being 3.0 g/mile. These results were obtained without exhaust gas return.

39266 **APTIC NO. 62743**

Sebestyen, T. M.

EPA IN-HOUSE COMPONENT IMPROVEMENT STUDY. *North Atlantic Treaty Organization, Committee on the Challenges to Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 290-295. (Oct. 14-19.)*

A study on the fuel economy of the conventional American family car is reviewed. The composite driving cycle with an average speed of 50 mph gave 14.8 mi/gal fuel economy, the Federal driving cycle gave 12.5 mi/gal. Improvements in fuel economy can be gained through the following methods, however, some may increase emissions, increase costs, and give other trade-offs: carburetion (atomization, mixing, warm-up), fuel injection (no intake heat mixing, no deceleration fuel), ignition (spark energy and duration), stratification (no throttling, compression ratio, lean mixture), engine friction (design), exhaust loss (variable geometry), accessories (constant speed drive), Rankine APU (constant speed accessory drive, heat recovery), turbocharging (displacement), variable displacement (load matching), regenerative braking (recovering kinetic energy), transmission modifications (torque converter lock-up), and infinitely variable transmission (optimum engine operation, efficiency). Although these improvements will add to the initial cost of the vehicle, the fuel savings could reduce total costs.

39267 **APTIC NO. 61744**

Shah, Indravadan and Alexander Kirschner

GAS SCRUBBER. *(Chemical Construction Corp., New York) Brit. Pat. 1,328,990. 8p., Sept. 5, 1973. (Appl. Nov. 12, 1970, 8 claims).*

A downward flow venturi gas scrubber with a throat approach section consisting of one or more conical baffles onto which liquid can be flowed is described. The scrubber is used to scrub gas streams with a liquid to remove entrained solid particles or liquid droplets or to selectively remove a gaseous or vaporous component. The scrubber is particularly applicable to the scrubbing of waste or stack gases with water or an aqueous solution, to remove impurities such as fly ash or sulfur dioxide, and thereby prevent air pollution. The scrubbing liquid flows downwards on the wall of the converging approach section for projection into the gas stream within the throat section. Improved results over other scrubbers are generally attained by the provision of a projection lip within the approach section and spaced above the throat section, with the lip having greater dimension or diameter than the throat itself.

39268 **APTIC NO. 62780**

Shah, Indravadan Shantilal

PROCESS FOR THE RECOVERY OF SULFUR DIOXIDE FROM WASTE GAS. *(Chemical Construction Corp., New York) Brit. Pat. 1,320,850. 5p., June 20, 1973. (Appl. May 28, 1971, 9 claims).*

A process for the removal of sulfur dioxide from waste gases derived from the combustion of a sulfur-containing carbonaceous or hydrocarbon fuel or the tail gas from a sulfuric acid production process is described. The SO_2 is removed from the gas before it is released to the atmosphere and is recovered in the form of useful S-containing products. Another advantage is that the process utilizes the inexpensive sodium sulfite to absorb the SO_2. The two compounds react in aqueous solution to form sodium sulfite-bisulfite. A portion of that solution reacts with recycled sodium carbonate to convert or regenerate bisulfite to sulfite which is then recycled for further waste gas scrubbing.

39269 **APTIC NO. 61723**

Shick, P. E., S. A. Hider, and C. G. Anderson

DEVELOPMENT IN RECOVERY OF SULFITE COOKING CHEMICALS: AN ADVANCED CARBONATION

RECOVERY SYSTEM. TAPPI, 56(8):96-98, Aug. 1973. 16 refs.

A new advanced carbonation system particularly applicable to recovery of liquors for neutral or alkaline sulfite pulping processes and conversion from the kraft process is described. It is a relatively simple recovery which requires neither crystallation of carbonate or bicarbonate, nor concentration of carbon dioxide or sulfur dioxide in a separate system. It is essentially self-sufficient in carbon dioxide and energy requirements and can be operated independently of the recovery furnace. No gases are vented from the carbonation step to the atmosphere. (Author abstract)

39270 **APTIC NO. 61900**

Shimizu, Hiroshi, Akira Mizuuchi, and Fumio Yokoyama

METHOD TO REMOVE BY ION EXCHANGE RESIN MIXTURE OF IODINE AND ALKYL IODIDE COMPOUNDS FROM GAS PHASE OR WATER SOLUTION LIQUID PHASE. *(Ion kokan jushi no yori kiso matawa suiyoekiso kara youso to youka arukiru kagobutsu no kongobutsu o jokyo suru hoho). Text in Japanese. (Organo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-37672. 9p., Nov. 13, 1973. (Appl. Oct. 4, 1968, 2 claims).*

The method uses three layers of different ion exchange resins to filter a gas or water solution containing a mixture of salt, iodine, and alkyl iodide compounds, therby removing the mixture from the gas or water solution. In the method constituting the first claim, the said gas or water solution is placed in contact first with a layer of hydrogen-type, strong-acidity, positive ion exchange resin, then with a negative ion exchange resin containing quaternary ammonium, and finally with another negative ion exchange resin containing tertiary amine of free basic type. The order of contact may be reversed for the latter two negative ion exchange resins or the two may be mixed to form a single layer to contact the gas or water solution. In the second method, the said gas or water solution is placed in contact first with a layer of negative ion exchange resin containing a tertiary amine next with a hydrogen-type strong-acidity positive ion exchange resin, and finally with a negative ion exchange resin containing quaternary ammonium.

39271 **APTIC NO. 61920**

Shinra, K.

FORMATION OF NITROGEN OXIDES AND ITS REGULATION. *(Chisso sankabutsu no hassei to sono kisei). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 1-6, 1973. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

According to Japanese environmental standards for nitrogen oxides effective in 1973 the one day average concentration of nitrogen dioxide should be lower than 0.02 ppm. The formation of NOx during combustion and removal techniques for NOx are discussed. Nitrogen oxides are lowered by lowering the flame temperature so that longer flame burning and injection of steam or water will reduce exhaust NOx. General measures to reduce NOx include lowering the combustion velocity to reduce the flame temperature, shortening the time of high temperature burning, lowering the flame temperature, operating at low excess air, operating at low thermal load, and employing fuels with lower nitrogen content. Reduction techniques so far developed mostly concern modification of combustion methods and they have achieved a 30-40% reduction in emission of NOx, which satisfies present environmental standards. Because of the rapid growth of fuel consumption, however, they will not satisfy future environmental standards. Among new techniques being developed adsorption, catalytic reduction, wet reduction, wet absorption, solution reduction, and complex formation appear promising.

39272 **APTIC NO. 62232**

Shultz, F. G. and P. S. Lewis

HOT SULFUR REMOVAL FROM PRODUCER GAS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-2-1 to III-2-10, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

Sulfur-free gas for power generation or catalytic conversion to pipeline gas is needed to meet near term energy and antipollution requirements. Gasification of coal with air or oxygen and steam at elevated pressures supplies the gas, but cleaning is required to remove sulfur and particulate matter. A stirred-bed pressurized producer is described, and results are discussed for caking coals. Progress is reported in developing a process using a regenerable solid sorbent for removing hydrogen sulfide from hot producer gas with recovery of elemental sulfur formed during regeneration. The H2S can be removed by contacting the hot gas with a bed of solid sorbent containing iron oxide; elemental sulfur is recovered during regeneration of the sorbent. Sintered pellets of iron oxide-fly ash can be used for the chemisorption. (Author abstract modified)

39273 **APTIC NO. 61953**

Smale, John Reginald and Francis Lambert Robson

IMPROVEMENTS IN OR RELATING TO GAS SCRUBBERS. *(Assignee not given.) Brit. Pat. 1,329,277. 6p., Sept. 5, 1973. (Appl. Oct. 28, 1970, 19 claims).*

An improved and economical gas scrubber of the vortex type that incorporates a fan is described. A different type of fan from the conventional radial flow type is used. It provides a flow pattern in which the gas flow is induced radially inwardly over a large part of the periphery of the fan rotor due to the creation of a vortex within the fan rotor. Scrubbing liquid introduced into the center of the vortex is broken down into small droplets and enters the centrifugal force field within the fan rotor. The droplets are flung radially outwardly through the periphery of the fan rotor in contra flow to the gas flowing inwardly. The resulting scrubbing action is highly efficient with markedly lower power consumption than other systems of comparative efficiency employing external fan systems. The scrubber may be used for absorption type scrubbing applications, for chemical scrubbing, for the removal of solid particulate material from gas streams, or for conditioning solid particulate material present in gas streams to permit subsequent removal of the conditioned solid particulate matter.

39274 **APTIC NO. 62691**

Stastny, E. P.

DESIGNING AND CASTING OF CONTROL EQUIPMENT TO MEET OPACITY REGULATIONS. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 5p., 1973. (Presented at the Air Pollution Control Association, South Atlantic Section, Spring Meeting, Visual Emissions Regulations and Control, Baltimore, Md., May 18-19, 1973.)*

The design and cost of control equipment to meet opacity regulations are discussed. Many existing codes use as a criteria of satisfactory operation a stack plume of a density related to a reading on a Ringelmann Chart or an equivalent opacity. This is really a subjective measurement based on individual interpretation of stack effluent appearance, and is no basis for design of cleaning equipment. Ringelmann is only an indication of what is coming out, but does not necessarily relate to the actual amount, by weight, of the emissions from the stack. It is recommended that the Environmental Protection Agency set the weight emission levels to which industry specifies and equipment manufacturers build to, such levels being on a conservative basis to satisfy the desire to maintain a generally acceptable stack appearance in the majority of cases. The cost of the cleaning equipment to go to a clear stack emission as compared to the process weight emission may range 5-10%

more for the large installations, and 15-25% more for the smaller.

39275 **APTIC NO. 62234**

Stewart, J. T. and E. K. Diehl

FLUIDIZED-BED GASIFICATION-PROCESS AND EQUIPMENT DEVELOPMENT. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. III-1-1 to III-1-18, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

A multiple fluidized bed coal gasification process was developed for the production of low-Btu fuel gas. The goal is gasification of both caking and noncaking coal, with fuel gas as the only product. The BCR (Bituminous Coal Research) gasifier concept is described. The program began with laboratory scale kinetic experiments and has progressed through the semi-continuous operation of a small fluidized bed batch reactor. A process and equipment development unit with three fluidized bed reactors, a gas quenching and scrubbing system, facilities to preheat reactor inlet gases, and solids handling equipment is being designed. The three-stage fluidized bed concept involves pretreatment, major gasification, and final carbon burn-up. In laboratory studies, six different chars with volatile content from 3 to 12% were produced from all ranks of coal and analyzed for reactivity. A mathematical model and regression analysis were used in a kinetic study of the char/steam and char/carbon dioxide reactions. Experimental results, process and equipment development, and the kinetics are described.

39276 **APTIC NO. 62611**

Stokes, M. A.

GAS TURBINES FOR RAIL TRACTION. *Preprint, National Society for Clean Air, Brighton (England), 22p., 1973. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

The application of gas turbines for trains and locomotives is discussed. Gas turbines are currently being used to some extent on French Railways, German Federal Railways, Japanese National Railways, USSR Railways, British Rail, and the UAC Turbo train in the United States and Canada. Gas turbines are constant combustion units and they face the same emission problems as those of aircraft with the exception that they operated entirely on the ground, but over a very narrow piece of the countryside. One major adjustment that would have to be made is the practice of idling the engine for a long period inside the station.

39277 **APTIC NO. 62129**

Suetaka, Toru

STUDIES ON THE ELIMINATION OF BAD ODORS. 3. DEODORIZATION BY DIRECT COMBUSTION. *(Akushu jokyo ni kansuru kenkyu. 3. Chokusetsu nensho dasshuho). Text in Japanese. Osaka-fu Taiki Osen Boshi Gijutsu Shiryo (Data Preven. Air Pollut. Osaka Prefect.), no. 9:35-47, April 1973. 4 refs.*

Experiments with a newly developed combustion deodorizer equipped with a heat recovery system are discussed, together with the methods of pretreatment of gases. Most important pretreatment is the removal of noncombustible gases such as water and nitrogen to allow the temperature to rise. The equipment is fully automatic and remove 99.9% of the odorous gases. The operating temperature was 500-700 C. The problem with this method is the possible production of combustion nitrogen oxides. The exhaust gas may contain sulfur dioxide if sulfur compounds are present in the treated gas. It is necessary to operate combustion deodorizers under appropriate conditions of temperature and pressure.

39278 **APTIC NO. 62139**

Suetaka, Toru

STUDIES ON THE ELIMINATION OF BAD ODORS. 4. ADSORPTION METHOD. *(Akushu jokyo ni kansuru kenkyu. 4. Kyuchakuho). Text in Japanese. Osaka-fu Taiki Osen Boshi Gijutsu Shiryo (Data Preven. Air Pollut. Osaka Prefect.), no. 9:48-62, April 1973.*

The applicaton of adsorption to deodorization is discussed. The characteristics of the adsorption method include the removal of contaminants from the gas flow, odor concentration does not affect removal efficiency, and the operation is simple. It is necessary to choose the proper adsorbent for particular components. Generally, an odorous gas consists of several ill-smelling components and it is therefore necessary to use several adsorbents. It is necessary to periodically replace or recover the adsorbents. The most popular adsorbents are active carbon, silica gel, alumina gel, molecular sieves, and ion-exchange resins. For the adsorption of acidic gases, various alkaline adsorbents have been developed. Actual examples of deodorization equipment are given for the treatment of emissions from an animal food factory, the removal of chlorine, odor removal from the stack gases of factories where solvents are recovered, and odor removal in agricultural chemicals factories. The performance of adsorption towers lowers with the progress of the so-called adsorption zone. As soon as the top of the adsorption zone reaches the top of an adsorption tower, the performance of the tower rapidly falls. The method to calculate the time when the adsorption zone reaches the top of an adsorption tower was explained.

39279 **APTIC NO. 62242**

Sverdrup, E. F.

GAS TURBINES FOR FLUID-BED BOILER COMBINED CYCLE POWER PLANT. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-4-1 to V-4-10, EPA-650/2-73-053. 12 refs. (Dec.)*

NTIS: PB 231977/AS

Gas turbines for fluidized bed combined cycle plants must be engineered to accept hot, high-pressure gases containing erosive dust and small concentrations of compounds that are potentially harmful through hot corrosion and fouling of turbine surfaces. A comprehensive program was set up to provide gas turbines for these plants. The program involves reducing the concentrations of alkali metal compounds and particulates presented to the turbines; engineering the turbines to accept the hot, high pressure gases; incorporating the turbine design features which make the turbine resistant to attack; and establishing the tolerance of the turbine components for combined hot corrosion-erosion attack. (Author abstract)

39280 **APTIC NO. 61971**

Taylor, W. C., J. C. Haas, and P. P. Principle

A REPORT ON THE TRANSPORATION OF AIR POLLUTION CONTROL SYSTEM SULFATE SLUDGE. *Probl. Beyond Removal, Proc. Elec. World Eng. Manage. Conf. Waste Disposal Util. Environ. Syst., Chicago, Ill., 1973, p. 335-350. (Oct. 31.)*

Sludge from alkali scrubbing of stack gases was tested as an economical material for building highways by supplying some of it for use in a paving demonstration project. Parts of a parking lot were paved with a mixture of fly ash and sulfate sludge from an acid plant, with sludge from an acid mine drainage system, and with sludge from alkali scrubbing of stack gases. The sludge was transported by flat and round monitored trucks after being dredged from a storage pond. Storage of the sludge on the trucks, loading and unloading, and transportation are described. Samples were taken every 200 mi, except for the first 200 mi when four samples were taken. De-watering occurred early in the transportation. With a minimum of effort, the released water was contained and presented no problem with leaking on the highway. The sludge had not been previously de-watered or mixed with a chemical stabilizer. The cost of transportation of sludge by either truck or train is presently economically prohibitive, however.

39281 **APTIC NO. 62651**

Teixeira, D. P., N. Bayard de Volo, and C. England

DESIGN OF A SUBSCALE UTILITY BOILER NATURAL GAS BURNER. *Preprint, Combustion Inst., Pittsburgh, Pa., 12p., 1973. (Presented at the Combustion Institute, Central States Section, Spring Meeting, Champaign, Ill., March 27-28, 1973.)*

The effects of stoichiometry, reduced inlet air temperature, and product gas recirculation were studied during natural gas firing in efforts to reduce nitrogen oxides emissions from utility boilers. The impact of these parameters on flame stability were evaluated. The rational used to model power plant natural gas flames is described and available full scale NOx data are compared with subscale results to confirm the accuracy of the scaling criterion. The data are compared with theoretical premixed chemical kinetic calculations. Accurate information regarding NOx emissions from natural gas fired utility boilers can be accomplished if careful attention is given to modeling the chemical and transport properties occurring in the full scale system. Premixed kinetics theory predicts much greater reductions than actually measured. (Author abstract modified)

39282 **APTIC NO. 61734**

Temple-Pediani, Roderick William

SEPARATION AND RECIRCULATION OF SOOT CONTAINED IN THE EXHAUST GASES OF COMPRESSION IGNITION ENGINES. *(Assignee not given.) Brit. Pat. 1,334,472. 7p., Oct. 17, 1973. (Appl. April 11, 1972, 7 claims).*

A method of separating and recirculating soot contained in the exhaust gases of compression ignition engines is described. The exhaust gas is separated from a compression ignition engine into two streams: a major stream consisting of essentially soot free exhaust gas which is discharged to the atmosphere as normal; and a minor stream consisting of a relatively small amount of exhaust gas which is laden with the bulk of soot in suspension which is discharged into the inlet air pipe. The soot follows a closed circuit in which soot produced and emitted from the engine from one combustion cycle is separated out and recirculated back into the engine to be burned during the subsequent combustion cycles. The minor stream of exhaust gas carrying the soot into the inlet air pipes reduces the combustion temperature and the formation and emission of nitrogen oxides.

39283 **APTIC NO. 62696**

Thompson, R. E. and D. P. Teixeira

THE EFFECTIVENESS OF COMBUSTION CONTROL IN REDUCING NOX FOR OIL FIRED POWER PLANT BOILERS. *Preprint, Combustion Inst., Pittsburgh, Pa., 15p., 1973. 2 refs. (Presented at the Combustion Institute, Central States Section, Spring Meeting, Champaign, Ill., March 27-28, 1973, Paper 115.)*

The effectiveness of combustion control in reducing nitrogen oxides for oil fired power plant boilers is described. The unavailability of natural gas has forced fossil fuel power plants in Southern California to burn low sulfur oil fuel for increasingly longer periods. Although current regulations permit higher NOx emissions on oil fuel, Southern California Edison has made a major commitment to minimizing late NOx reduction methods. Through effective combustion modification, reductions in nitric oxide of 30-50% have been achieved. The application of off-stoichiometric combustion has been more successful than overfire air or NOx ports and can be implemented with little or no control system changes. Comparison test data re shown for power plants ranging in size from 175 to 480 Mw. The importance of boiler geometry and unit design in NO emissions is illustrated by comparing boilers in the same size range. The NO emissions versus load characteristics of several boilers are discussed with cautions concerning the general application of test data without recognizing the individual character of each specific unit. (Author abstract modified)

39284 **APTIC NO. 62716**

Thur, George M.

GAS TURBINE DEVELOPMENT OVERVIEW. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 62-68. (Oct. 14-19.)*

A research program to evaluate the feasibility of alternative power systems is reviewed. The need for low pollution emissions and improved fuel economy have led to increased demand for alternative power plants. The Otto cycle engine modified for emission control will aggravate an already difficult fuel supply problem in this country by 1985. Average fuel economy curves over the Federal Driving Cycle are shown for various alternative power plants such as the Rankine, Brayton, Stirling, diesel, stratified charge, gas turbine, and Wankel engines. Thermal efficiency over the Federal Driving Cycle is shown for these engines compared to the 1973 certification test data. The gas turbine development program is described including the tasks and research schedule. The intent is to demonstrate a practical gas turbine powered vehicle which satisfies the emission goals and fuel economy goals by late 1975. The 1975 fuel economy goals and the 1980 projections are shown.

39285 **APTIC NO. 62723**

Thur, George M.

RANKINE SYSTEM DEVELOPMENT OVERVIEW. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 159-161. (Oct. 14-19.)*

The goals of the Environmental Protection Agency Rankine development program are to meet 1/2 of the 1976 emission standards, improve fuel economy over conventional, pre-controlled vehicles by 50%, have the same performance, and still fit into a full size car. Four contractors are in the pre-prototype development stage and expect to demonstrate emission and fuel economy goals by the end of 1973. Their approaches are organic-turbine, steam-turbine, organic-reciprocating, and steam-reciprocating engines. The schedule for the Rankine system development program and problems of the Rankine engine which must be solved are also mentioned.

39286 **APTIC NO. 61925**

Tono, I.

ON THE NOX REDUCTION. *(Chisso sankabutsu no teigen taisaku ni tsuite). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 7-33, 1973. 54 refs. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

Nitrogen oxides reduction techniques, the mechanism of NOx formation, and amounts and sources of NOx emissions are discussed. In order to reduce NOx formation the combustion velocity should be lowered to reduce the maximum burning temperature, the high temperature residence time of the combustion gas should be kept as short as possible, the flame temperature should be lowered, and combustion should be carried out at low excess air. These measures require equipment, fuel, and operation modifications, and the development of techniques for stack gas nitrogen removal. Low speed combustion, two-stage combustion, and recirculation are explained as examples of equipment modification for fixed and mobile emission sources (the Honda CVCC engine and recirculation system). Low excess air combustion, changes in damper opening and burner angle, cold air combustion, low thermal load combustion, and low exhaust oxygen concentration combustion are explained as examples of operation modification. The use of lighter oil, lower nitrogen content fuel, and methanol are also discussed. Various nitrogen oxides removal techniques are described.

39287 **APTIC NO. 62206**

Troth, D. L., A. J. Verdouw, and F. J. Verkamp

INVESTIGATION OF AIRCRAFT GAS TURBINE COMBUSTOR HAVING LOW MASS EMISSIONS. *General Motors, Indianpolis, Ind., Detroit Diesel Allison, Air Mobility Research and Development Laboratory Contract DAAJ02-72-C-005, Task 1G162207AA7102, Directorate Rept. 7725, 730p., April 1973. 33 refs.*

NTIS, DDC: AD 764987

A 50% overall reduction in gas turbine engine mass emissions (carbon monoxide, hydrocarbons, nitrogen oxides, and smoke) was demonstrated in a typical Army light observation helicopter (LOH) duty cycle. The selected baseline was the Army T63-A-5A gas turbine engine combustor. The selected duty cycle consisted of five operating points from idle (15% time) through maximum power (5%) time). The major pollutant was CO (78% of the total). Of pollutants in the regenerative T63 engine, 42% were NOx, while 47% was CO. Three approaches were used to analyze and select low emission concepts: emission reaction kinetic model predictions, empirical emission correlation predictions, and a literature survey. The baseline combustor experiments were conducted to establish the baseline emission index and to establish correlation between combustor rig and available engine emission data, agreement was established with 2%. Two combustors selected for final experimental evaluation were the Prechamber and Modified Conventional. The low emission feature in the Prechamber was premix/prevaporization. The Modified Conventional combustor incorporated four low emission features: airblast fuel atomization, delayed dilution, convection cooling, and variable geometry. Both combustors met the emission reduction objectives. (Author abstract modified)

39288 **APTIC NO. 61748**

Tsuji, Masakazu

AIR POLLUTION AND COMBUSTION TECHNIQUES. *(Taiki osen to nensho gijutsu). Text in Japanese. Aromatikkusu (Aromatics), 26(2): 14-22, 1973.*

Various types of air pollutants produced by combustion, their formation mechanisms and control methods are discussed. Carbon monoxide, soot, sulfur oxides, smut, white smoke, nitrogen oxides, nitric oxide, and the effects of combustion conditions, air-fuel ratio, combustion load, combustion chamber structure and burner structure, the temperature of combustion chamber wall, the temperature at the entrance, and operating conditions are examined. In large boilers and furnaces, the combustion chamber should be designed so that the flame will form along the wall to minimize NO formation and improve heat efficiency. The combustion method should be frontal. The maximum flame temperature potential is proportionate to the unit area combustion load ratio. In internal combustion engines such as gasoline, diesel engines, and gas turbines, reducing the maximum flame temperature requires even filling of the combustion chamber with flame. This reduces heat efficiency. Therefore, the control of NO formation and improvement of heat efficiency contradict each other. The maximum flame temperature potential is proportionate to the volume of the combustion load ratio. Two-stage combustion and recirculation of combustion gas are two solution methods. The first method supplies combustion air in two stages: first, less air than the theoretical air, and second, the remaining air is supplied. For gas combustion, the primary air can be reduced to 60-70% of theoretical air without increasing soot. When the fuel is heavy oil, the primary air cannot be reduced more than 20% without increasing the amount of soot. Recirculation of combustion gas in combustion air increases inactive gas and the head capacity and lowers combustion temperature, decreasing NO. This method is effective for controlling thermal NO, but not for fuel NO. Fuel additives such as water, methanol, and metal compounds can be used for the control of NO. Methanol has basically the same effect as water and is effective for thermal NO but not for fuel NO. Metal additives can decrease NO by 15-30%, but the cost and the secondary pollution possibilities must be examined.

39289 **APTIC NO. 62165**

Tsuritani, Taiichi

TECHNIQUE OF DISPOSAL OF DISCHARGED GASES. *(Haigasu shori gijutsu. 1.). Text in Japanese. Seifuti Daijesuto (Safety Dig.), 19(9):351-363, Sept. 1973.*

Waste gas treatment and characteristics of poisonous gases and steams are discussed. For the treatment of stack gases, physical properties (such as boiling point, melting point, specific gravity, and vapor pressure), chemical properties (such as inflammability and explosiveness), and biological properties (such as toxicity) are important. Absorption, adsorption, combustion, and catalytic oxidation are used as control methods. Water and solutions of alkali in water are often used for the absorption of waste gases. Hydrogen chloride, hydrogen sulfide, and various acidic gases are effectively eliminated by this method. Active carbon is effective for the adsorption of nonpolar solvent vapors. Regeneration of active carbon is done with water vapor. Combustion is effective for organic gases, but this method cannot be used for waste gases containing sulfur compounds, sulfides, halogens, amines, and various nitrogen compounds because these appear as hazardous gases after combustion. Various data are given for chlorine, hydrocyanic acid, mercury, hydrofluoric acid, hydrogen sulfide, ammonia, carbon monoxide, hydrochloric acid, sulfur dioxide, ethylene cyanide, phenol, carbonyl chloride, formaldehyde, CH2CHCH, and toluene diisocyanate and other lesser compounds.

39290 **APTIC NO. 62241**

Vogel, G. J., E. L. Carls, J. Ackerman, M. Haas, J. Riha, and A. A. Jonke

BENCH-SCALE DEVELOPMENT OF COMBUSTION AND ADDITIVE REGENERATION IN FLUIDIZED BEDS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluuid. Bed Combust., 3rd, 1973, p. I-1-1 to I-1-36, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

The fluidized bed combustion of coal and oil with excess air and the combustion of coal in a deficiency of air are discussed. Thermodynamics of several proposed regeneration processes and the regeneration of sulfur-containing additive by the one-step reductive decomposition of calcium sulfate and a two-step (reduction-carbon dioxide/water) procedure are reviewed. Bench- scale fluidized bed coal combustion experiments with excess air are described including the effect of operating variables on sulfur dioxide retention, nitric oxide levels in the flue gas, and calcium utilization. Bench scale experiments under air deficient conditions are discussed including concentrations of pollutants in the flue gas, the effect of decreasing air input on the ratio of hydrogen sulfide to H2S + SO2 in flue gas, sulfur retention, NO levels in the flue gas, sulfur compounds in the bed, carbon balance and advantages of the process. Air excess, oil combustion experiments are discussed including removal of SO2, effects of temperature on sulfur retention, and the shape of the curve for sulfur retention as a function of the Ca/S mole ratio. Additive decrepitation rates during coal combustion, cyclone collection efficiencies during coal combustion, and combustion efficiencies for coal, oil, and gas with excess air are also discussed. The regeneration of sulfur containing additives by reductive decomposition of calcium sulfate, roasting of calcium sulfide in air or oxygen, and reaction of calcium sulfide with water and carbon dioxide were studied thermodynamically and experimentally. A description is given of a pilot plant for pressurized combustion and regeneration.

39291 **APTIC NO. 62614**

Vulliamy, N. M. F.

WHY DO DIESELS MAKE SMOKE - HOW MAY IT BE ABATED? *Preprint, National Society for Clean Air, Brighton (England), 33p., 1973. 3 refs. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

The causes and control of smoke from diesel engines are discussed. The fundamental causes of smoke are the amount of air available to the fuel, the mixing of fuel and air, and the prevailing temperature at injection. There is ample experience that properly planned maintenance and general care by drivers and service mechanics results in engines which do not produce excess smoke and have much longer lives. Turbocharging is a smoke control measure because it enables an engine to receive more air for combustion. It has technical problems and is expensive. Another method of smoke reduction is to replace a portion of the liquid fuel at high load by a suitable gaseous fuel, as liquefied petroleum gas, aspirated with the intake air. It burns without smoke, but is very costly. There are other forms of combustion engines that are proposed for use, but all of them burning liquid hydrocarbon fuels to economic advantage are subject to similar rules of combustion as is the diesel--sufficient air, correct mixing, and temperature.

39292 **APTIC NO. 62023**

Wackernagel, Rudolf

PROCESS FOR THE REMOVAL OF HYDROGEN SULPHIDE FROM GASES CONTAINING HYDROCARBONS. *(Friedrick Uhde G.m.b.H. Postfach, Germany) Brit. Pat. 1,324,732. 4p., July 25, 1973. (Appl. June 30, 1971, 4 claims).*

An improved process for the removal of hydrogen sulfide from gases containing hydrocarbons is described. It consists of pressure scrubbing and subsequent regeneration of the charged scrubbing agent. The scrubbing agent used is (propionic acid-methyl ester)-phosphonic acid dimethyl ester. The compound has a particularly good absorptive capacity and an absorptive selectivity at higher pressures in respect to carbon dioxide compared to the previously known tri-n-butylphosphate.

39293 **APTIC NO. 62238**

Wade, G. L. and A. A. Furlong

FLUIDIZED-BED COMBUSTION OF MUNICIPAL SOLID WASTE IN THE CPU-400 PILOT PLANT. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. II-3-1 to II-3-17. EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

A large, high pressure fluidized bed combustor for incineration of municipal refuse was studied. The solid waste is fed into the combustor through high pressure air-lock feeder valves and a pneumatic transport line. In the fluidized bed, inert sand-sized particles are buoyed and mixed by an upward flow of air from the compressor. Heat released by the solid waste combustion maintains the fluidized bed and exiting gas products between 1300 and 1700 F. Several particulate removal stages operate on the combustion gases prior to their admission into the gas turbine. The system recovers energy as electric power which reduces the operating costs to $2-5/ton compared with current incinerator costs of $8-14/ton. Advantages of fluidized bed combustion, the pilot plant, combustion test results, and exhaust gas composition are discussed. The fluidized bed combustor is highly efficient, easily fed, and readily controlled. There is no problem with fluidized bed residue buildup. Relatively large metal and inert particles entering the active bed experience gradual oxidation or attrition to typical bed size particles and eventually are elutriated to be collected by particle separators. No bed material agglomeration is experienced in the 1270-1450 F bed temperature range. Gas phase combustion above the fluidized bed is reduced to acceptable values without resorting to undesirable remedies such as extensive internal bed structures, numerous fuel feed points, or deeper bed, multi-stage combustors. Earlier combustor freeboard and exhaust system deposit problems due to the aluminum content of solid waste are solved. Performance of the first stage inertial separator is very promising and is expected to further improve at high pressure conditions. Reliable handling and transportation of removed hot, fine ash pose development problems. Since sulfur dioxide content is low, nitrogen oxide levels are close to proposed standards, and only hydrogen chloride poses a potential pollution control problem, the pollution control effort required for the process can be expected to be minimal.

39294 **APTIC NO. 62667**

Waitzman, D. A., J. L. Nevins, and G. A. Slappey

MARKETING H2SO4 FROM SO2 ABATEMENT SOURCES -- THE TVA HYPOTHESIS (FINAL REPORT). *Tennessee Valley Authority, Muscle Shoals, Ala., Office of Agricultural and Chemical Development, Environmental Protection Agency Contract EPA-IAG0134D (Part B), ROAP 21ADE-24, Program Element 1AB013, Rept. EPA-650/2-73-051, 107p., Dec. 1973. 12 refs.*

NTIS: PB 231671/AS

A hypothetical study, using the Tennessee Valley Authority power production system as a model, was made on marketing abatement sulfuric acid from stack gas sulfur dioxide removal processes and acid production facilities in order to create a computer model for determining the net sales revenue, to compute the transportation cost of shipping the acid to older existing acid producers, and to evaluate selling the acid at or below basic manufacturing cost. Considering 10,000 MW of a total 18,000 MW coal-burning capacity for H2SO4 production, about 2 million tons of H2SO4 was estimated to be produced. A net sales revenue of $5 to $9/ton was indicated, assuming TVA would be the only utility producing abatement acid. The computer model developed for the study is capable of being expanded to include other utilities in the United States. (Author abstract modified)

39295 **APTIC NO. 62746**

Wallin, S.

LEAD PARTICULATES IN THE EXHAUST. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 308-310. (Oct. 14-19.)*

A study to evaluate lead-trap exhaust filters for gasoline engines is described. Road tests are being made on 20 vehicles to obtain an in-service assessment of the lead filter and a laboratory series of life and performance tests using a dynamometer has been initiated. During the lead trapping process, the lead halides react with the sulfur dioxide to give lead sulfate. Reducing lead in fuel produced a lower filter efficiency; replacement of lead by aromatic constituents also produced a lower filter efficiency. In another study a commercially available, portable atomic absorption spectrophotometer was modified to monitor lead compounds in diluted exhaust gases. The instrument could be used to measure 0-40 mg/cu m of lead in the diluted gas equivalent to 0-1000 mg/cu m in the exhaust gas itself. The system was used to measure lead emissions from vehicles under different driving conditions with an exhaust filter. Results are presented for lead concentrations detected in the dilution system on the same section of road for 1.3 and 3.0 l vehicles.

39296 **APTIC NO. 62729**

Wenstrom, Mike and Roy Renner

CALIFORNIA CLEAN CAR PROGRAM. *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society and Environmental Protection Agency, Office of Air and Water Programs, Proc. Air Pollut. Symp. Low Pollut. Power Syst. Dev., Ann Arbor, Mich., 1973, NATO Document 32, p. 200-202. (Oct. 14-19.)*

Two Rankine cycle systems will be tested in subcompact automobiles suitable for urban driving to prove the viability of a low emission power plant in a compact vehicle. Initial versions of the major components of the power systems have been fabricated and are now being tested and improved. One power plant features a single-stage impulse steam turbine driving through a hydrostatic transmission. Low-emission characteristics have been validated. The second engine is a four-cylinder, double-acting, compound- expansion steam engine. Power is delivered through a two-speed automatic mechanical transmission. Vehicle characteristics are listed. Emissions from the first engine are expected to be 0.24 g/mi carbon monoxide, 0.06 g/mi hydrocarbons, and 0.14 g/mi nitrogen oxides; emissions from the second engine are expected to be 0.42, 0.07, and 0.19, respectively.

39297 **APTIC NO. 62750**

Whitmyer, Alan

EVALUATION OF THE SPRITZER EMISSION CONTROL DEVICE. *Environmental Protection Agency, Washington, D. C., Emission Control Technology Div., Rept. 74-15-AW, 2p., Oct. 1973. 1 ref.*

The evaluation of the Spritzer emission control device is described. The device, which fits underneath the carburetor, is designed to produce better mixing and distribution of the intake charge and, at the same time, allows the use of a leaner fuel mixture to increase fuel economy and reduce exhaust emissions. A total of four tests were conducted on a 1972 3/4 ton GMC pick-up truck equipped with a 5.7 liter engine and a four speed manual gearbox. Use of the device resulted in no significant decreases in either hydrocarbons or carbon monoxide and in one test produced fairly substantial increases in both of these. The device decreased nitrogen oxides in two of the tests and produced no change in the third test. Fuel consumption increased in all three tests when the device was installed.

39298 **APTIC NO. 62753**

Whitmyer, Allan

EVALUATION OF THE STP MODULATING AIR BLEED. *Preprint, Environmental Protection Agency, Test and Evaluation Branch, 74-19 AW, 6p., Dec. 1973.*

A modulating air bleed device manufactured by the STP Corporation was tested in an uncontrolled car and in two cars with a moderate degree of emission control. The device is essentially an air bleed used in conjunction with a delayed spark advance. All tests were run according to the 1975 Federal Test Procedure. With a 20-second vacuum delay valve, there was a 38% decrease in hydrocarbons, a 42% decrease in carbon monoxide, a 120% increase in nitrogen oxides, and a 4% increase in fuel economy over baseline testing with a 1963 Chevrolet. With a 60-second vacuum delay valve, the HC and CO decreases remained the same while the NOx increased only 20% and fuel economy increased 1%. The 1970 Plymouth Valiant showed a 23% decrease in HC, a 66% decrease in CO, a 9% decrease in NOx, and a 6% increase in fuel economy. The 1971 Ford showed a 10% decrease in HC, a 46% decrease in CO, a 35% decrease in NOx, and a 1% decrease in fuel economy.

39299 **APTIC NO. 61804**

Wiemann, Hans-Juergen and Wilhelm Jugel

RESULTS OF INVESTIGATIONS CONCERNING DUST COLLECTION WITH CLOTH FILTERS. *(Ergebnisse von Untersuchungen zur Staubabscheidung mit Geweben). Text in German. Preprint, 8p., 1973. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, East Germany, June 28, 1973.)*

The dust collection process in cloth filters was studied. In particular, the velocity of the gas dust mixture, the temperature of the gas dust mixture, the cloth parameters, and the dust parameters and their effects on the collection efficiency were studied. The results were experimentally obtained with laboratory set-ups and theoretically confirmed. It can be proved that an exponential law governs the passage of the dust through the filter. The decisive variable is the load of the filter area. It determines the size of the filter, and greatly influences operating and maintanence costs. The filter load is tantamount to the average onflow velocity. Of large influence on the correct selection of the cloth and thus on the lifetime and reliability is the operating temperature. It is plausible that a coarse-meshed cloth filter suffices for the retention of coarse particles while a dense cloth is needed for fine dust. It could be proved that a filter cloth can be described by two parameters, by the pore radius of the cloth and Hagen s number. The pressure loss and resistance at the beginning of each filtering process depend on the gas velocity, the cloth, on the dust, and on the extent of filter cleaning, and they indirectly influence the dust peaks in the waste gas. The increase of tne resistance during the cake build-up phase is independent on the velocity above 100 cu m/sq m/hr and only a function of the dust. It is also independent of the cloth.

39300 **APTIC NO. 62612**

Williams, C. G.

THE ALTERNATIVE TO THE MOTOR CAR--OR ALTERNATIVE FUELS. *Preprint, National Society for Clean Air, Brighton (England), 36p., 1973. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

Alternatives to the gasoline powered internal combustion (IC) engines are discussed. There is current interest in the steam engine, gas turbine, and the Stirling engines because they can maintain continuous combustion which eliminates pollutants from unburned hydrocarbons. However, there are deficiencies in these engines. The gas turbine is expensive, the steam engine is deficient in power, cost, and fuel consumption, and the Stirling engine, though showing superior fuel consumption, is also deficient in power and cost. A lead powered battery vehicle is also being considered. It emits no pollutants at street level, but the power station which provides the necessary electricity itself emits pollutants. The battery also has to be recharged at intervals so as to restore its electro-chemical activity.

39301 **APTIC NO. 62610**

Williams, M. R.

CONTROL OF POLLUTION IN JET ENGINES. *Preprint, National Society for Clean Air, Brighton (England), 31p., 1973. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

Gas turbine pollution and the control of pollution in jet engines are discussed. The aircraft pollution picture can be analyzed in two parts of the flight operation: above and below the inversion layer of a typical city, which is in effect the region close to the environment of the airport and the cruise mode at high altitudes. The ecological impact of high altitude flight is being studied in the United States under a $12 million program, CIAP (Climatic Impact Assessment Programs). At low altitude, the aircraft apparently contributes up to a maximum of approximately 50% of the pollution at an airport. Meeting the Environmental Protection Agency s proposals is a difficult task. The combustion efficiency at idle power is currently 96-98%. The EPA wants an increase to 99.3% minimum efficiency. The justification of the regulations are questionable.

39302 APTIC NO. 62229

Wright, S. J.

THE REDUCTION OF EMISSIONS OF SULPHUR OXIDES AND NITROGEN OXIDES BY ADDITIONS OF LIMESTONE OR DOLOMITE DURING THE COMBUSTION OF COAL IN FLUIDISED BEDS. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. I-4-1 to I-4-15, EPA-650/2-73-053. (Dec.)*

NTIS: PB 231977/AS

Experiments were conducted on additions of limestone or dolomite to fluidized bed power plant combustors to reduce the proportion of sulfur dioxide and nitrogen oxides emitted from flue gas. The effects of coal type, size, quantity, and type of additive, combustion conditions, plant scale, and design features such as bed depth and recycling of incompletely reacted fuel and additive on emissions of SO2, NOx, and particulates were studied in a pilot plant. Laboratory scale experiments characterized the coals and additives used. A mathematical model was developed to assist in correlating the factors influencing the pollution control characteristics of a fluidized combustion system. The limestone or dolomite additives did reduce SOx to less than allowed by emission standards, 95% efficiency for a power plant burning a 3% sulfur coal in dense urban areas (100 ppm v/v SO2), 85% for built-up areas (300 ppm), and 67% for power stations generally in the U. S. (700 ppm). Nitrogen oxides were reduced by 60% less, but would not meet expected standards of 100-200 ppm. Particulates would probably not meet current or future restrictions. The additive is unlikely to cause fouling and corrosion of tubes immersed in the bed or deposition or erosion of turbine blade materials exposed to the combustion gases. The most important variable in terms of sulfur retention is the calcium/sulfur mole ratio. The most stringent requirement for SO2 emissions can be met if sufficient calcium is present in the bed. If economic factors require it, the usage of limestone/dolomite can be minimized by reducing the design fluidizing velocity; this will make the boiler bigger and more expensive. In terms of boiler operation and control, the most important variable is bed temperature which can affect sulfur retention. The bed temperature should be able to vary through the maximum allowable range, which would be 1460-1800 F for American coals. (Author conclusions modified)

39303 APTIC NO. 62126

Yano, Takeo and Tosu Suetaka

STUDIES ON THE ELIMINATION OF BAD ODORS. 1. INTRODUCTION. *(Akushu jokyo ni kansuru kenkyu. 1. Hajimeni). Text in Japanese. Osaka-fu Taiki Osen Boshi Gijutsu Shiryo (Data Preven. Air Pollut. Osaka Prefect.), no. 9:1-6, April 1973.*

The Japanese Odor Prevention Law was put into effect on June 1, 1972. The bad odors of natural origin are amines such as trimethylamine and dimethylamine, ammonia, hydrogen sulfide, mercaptans, organic aliphatic acids, indol, and scatol. Those of artifical origin are hydrogen sulfide, mercaptans, sulfides, aldehydes, alcohols, aromatic hydrocarbons, various organic sulfur and nitrogen compounds, halogens, and sulfur dioxide. The possible methods of elimination of these bad odors are direct combustion, adsorption, washing with various aqueous solutions, electrostatic methods, contact catalytic methods, oxidation with ozone, and treatment with chlorine. Odor removal by ozone is very effective. For example, 1 ppm ozone is effective to remove the odor of a sewage system. From 10-50 ppm is satisfactory for odor removal in pulp factories. This method is very economical. However, ozone itself exhibits an unpleasant odor. The oxidation by ozone is not complete. Therefore, some odors become even more unpleasant before the treatment because of the partial oxidation by ozone. Chlorine treatment using chlorine gas, sodium hypochlorite, and chlorine dioxide is also an effective means for odor removal.

39304 APTIC NO. 62179

Yukimachi, K., Y. Watanabe, and Y. Tsujimoto

FORMATION OF NOX AND STRUCTURE OF BURNER USING TOWN GAS. *(Toshi gasu nensho niokeru boirayo bana kozo to NOx hasseiryo). Text in Japanese. Preprint, Combustion Inst. (Japan), p. 139- 142, 1973. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 38.)*

The formation of NOx in presently operating boilers (5-20 ton/hr capacity) is discussed in terms of combustion systems and structure of burners. When used in the same type of boiler, an air spinning burner produced the least amount of NOx, followed by a vapor atomization type, and then a rotary burner. The formation of NOx was also dependent upon the input load. At low input, the difference in the NOx formation was largely dependent upon the type of burner used while at high input approaching 100% of the capacity, the difference became small. A hot gas self recirculating type burner was very effective in reducing NOx, but the formation of NOx increased with increasing capacity of the boiler. The dependence of NOx formation on the structure of the burner was also demonstrated for town gas-fueled boilers. The hot gas self recirculating burner and long flame type burner were the most efficient producing NOx less than 45 ppm (O2 3%) for the input of 500,000 to 4,000,000 kcal/hr.

39305 APTIC NO. 61014

(Inventor not given.)

INTERNAL COMBUSTION ENGINE EXHAUST CONTROL FOR AIR POLLUTION REDUCTION. *(Regeleinrichtung zur Verringerung der Luftverunreinigung fuer Verbrennungsmotore). Text in German. (Regie Nationale des Usines Renault Billancourt, Seine (France) and Automobiles Peugeot, Paris (France)) W. Ger. Pat. Appl. 2,230,612. 5p., March 15, 1973. 6 refs. (9 claims).*

An internal combustion engine exhaust control for air pollution reduction is described. At least one of the harmful components in the exhaust gas, preferably carbon monoxide, is determined quantitatively by means of a tellurium-lead thermocouple between two identical cooled exhaust gas streams, each flowing past the hot and cold points. The hot point is coated with activated aluminum containing 0.5% platinum with manganese, iron, cobalt, and nickel oxides for provoking exothermal catalytic oxidation of CO in the presence of additional air. The detected values are converted into electric signals transmitted to a transformer which controls engine operating parameters. The transformer transmits the signal information to a computer to control engine operating parameters by modifying fuel injection.

39306 APTIC NO. 61716

(Inventor not given.)

SEPARATING DEVICE FOR FINE PARTICLES SUCH AS CARBON PARTICLES FROM ENGINE EXHAUST GAS. *(Tokyo Roki Kabushikik Kaisha, Kawasaki (Japan)) Brit. Pat. 1,329,907. 7p., Sept. 12, 1973. (Appl. Dec. 31, 1970, 10 claims).*

A device for separating carbon, lead compounds, and fine heavy metal particles and other floating fine particles causing air pollution from engine exhaust gas is described. Many technical difficulties have been experienced in removing carbon particles from the xhaust gas. Normally, the C particles comprise fine particles in the range of 0.02-0.04 micron and combined particles of these fine particles in the range of 1-30 micron, so that these C particles cannot be effectively removed from the exhaust gas by the conventional filter media. The filter media have to be heat proof to resist the high temperatures existing in the exhaust line. This device satisfies these requirements. Fine particles entrained in an exhaust gas and charged with electricity while they are traveling along a combustion system and an exhaust line are fed to a magnetic field and are removed to be separated from the exhaust gas discharging outside an exhaust pipe.

39307 **APTIC NO. 61718**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO PREVENTING AIR POLLUTION ABOUT COKE OVENS. *(Koppes Co., Inc., Pittsburgh, Pa.) Brit. Pat. 1,329,523. 6p., Sept. 12, 1973. (Appl. Feb. 15, 1972, 9 claims).*

An apparatus for collecting dirty gases containing fumes and particulate matter issuing from hot, incandescent coke being pushed from a coke oven of a coke oven battery into a coke receiving car is described. The apparatus consists of a hood that may be moved along the coke side of the battery. It is capable of being disposed above a coke receiving car to collect the dirty gases. A collecting main extends along the length of the coke side of the battery and is connected to the hood by a duct.

39308 **APTIC NO. 61719**

(Inventor not given.)

APPARATUS FOR REMOVING DUST FROM AIR. *(Matsushita Dendo-Kogo Co., Ltd., Osaka (Japan)) Brit. Pat. 1,329,374. 4p., Sept. 5, 1973. (Appl. Dec. 20, 1971, 6 claims).*

An improved apparatus for removing dust from air which uses only one power source is described. It consists of a closed water tank; an annular float carrying an assemblage including a bowl surrounded by the float, a deflector plate spaced above the bowl, and an upright mobile cylinder extending through the upper end of the tank. The upper end of the cylinder is closed, while the lower end extends through the deflector plate and opens within the bowl. The interior is in the water, the lower end of the cylinder is below water level, and the deflector plate is above water level. There is an inlet pipe for the dust-laden air with an upright section protruding into the cylinder and an outlet pipe for purified air from the tank. The water in the bowl splashes upwards against the deflector plate which breaks it up into a screen of droplets.

39309 **APTIC NO. 61720**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO THE PURIFICATION OF SULPHUROUS GASEOUS EFFLUENTS. *(Shale Oil Corp., Morgantown, W. Va.) Brit. Pat. 1,331,114. 7p., Sept. 19, 1973. (Appl. Nov. 10, 1970, 16 claims).*

A process for removing sulfur dioxide, sulfur trioxide, and nitrogen dioxide from a gaseous effluent is described. Water is injected into the effluent which is held at a temperature above 250 F to vaporize. The gas is cooled to a temperature above the decomposition temperature range of ammonium sulfite (at least 160 F) to provide an aqueous vapor medium for reaction with ammonia. The NH_3 gas is dispersed throughout the effluent, which is an improvement over other systems, at a temperature above the decomposition temperature range of $(NH_4)_2SO_3$. The NH_3 is added in an amount of from 1.0 to 3.0 moles per mole of sulfur oxide. The NH_3-containing gas is cooled below the decomposition temperature range to form entrained ammonium salt particles which are removed from the effluent.

39310 **APTIC NO. 61741**

(Inventor not given.)

METHOD AND APPARATUS FOR CLEANING WASTE FLUE GASES. *(Hitachi Co., Ltd., Tokyo (Japan)) Brit. Pat. 1,333,635. 6p., Oct. 10, 1973. (Appl. Nov. 16, 1971, 6 claims).*

A method and apparatus for cleaning waste flue gases by removing such toxic gases as sulfur dioxide, nitrogen dioxide, nitric oxide, hydrogen sulfide, hydrogen fluoride, and fluorine is described. The method consists of spraying a reactant solution in the form of a fine mist into a hot waste flue gas, causing the toxic components contained in the waste flue gas to be absorbed by and react with the reactant solution. The water present in the droplets of the reactant solution is dried by the sensible heat of the waste flue gas and the reaction products are collected in the form of solid particles. The entire operation is carried out within a single spray drying tower in a short period of time in a manner to prevent a temperature lowering and humidity increase of the waste flue gas caused by the vaporization of the water contained in the sprayed reactant solution. The humidity of the flue gas released into the atmosphere is constantly maintained above the dew point to prevent the atmospheric pollution otherwise caused by the flue gas.

39311 **APTIC NO. 61743**

(Inventor not given.)

SYSTEM OF ABSORBING SO_2 GAS IN EFFLUENT GAS STREAM. *(Babcock and Wilcox Co., New York) Brit. Pat. 1,328,403. 6p., Aug. 30, 1973. (Appl. Oct. 19, 1970, 11 claims).*

A method for the absorption of sulfur dioxide from flue gases resulting from the combustion of fossil fuels is described. The collection efficiency of methods used in the removal of SO_2 is improved and the sulfur is converted into a usable or saleable form so as to minimize the economic loss while at the same time reduce air pollution emissions to the atmosphere. Entrained solids are removed from the gases and SO_2 is absorbed in a solution containing magnesium compounds reactive with SO_2. Hydrated magnesium sulfite crystals are precipitated and separated from the solution. They are thermally decomposed to produce reactive magnesium oxide particles and an SO_2 containing gas. The MgO is separated from the SO_2 containing gas. The solution containing SO_2 is recycled for further removal of SO_2.

39312 **APTIC NO. 61946**

Inventor not given

GAS WASHING APPARATUS. *(Gustav Ospelt Hovalwerk AG, Vaduz, Liechtenstein) Brit. Pat. 1,329,268, 19p. Sept. 5, 1973. (Appl. Sept. 15, 1970, 32 claims).*

A gas washing apparatus capable of being used for the cleaning of hot industrial gases is described. It simultaneously purifies the crude gas by separating out solid particles as well as absorbing injurious gases. The apparatus has lamellae forming a rotor through which a crude gas flows and is sprayed with a liquid. The gas and liquid passing between the lamellae are forcibly thoroughly intermixed, giving rise to a high degree of extraction of dust or other solids from the gas by the liquids, as well as a simultaneous high degree of absorption or chemical removal of injurious gases from the crude gas.

39313 **APTIC NO. 61947**

Inventor not given

A DEVICE FOR REMOVING ACIDIC AND INJURIOUS GASES CONTAINED IN THE AIR. *(Mitsubishi Denki Kabushiki Kaisha, Tokyo, (Japan)) Brit. Pat. 1,334,310. 7p., Oct. 17, 1973. (Appl. Dec. 29, 1971, 15 claims).*

An air purification device for removing acidic and injurious gases such as sulfur dioxide, hydrogen sulfide, or acidic mist from the air is described. The device consists of hygroscopic material and at least one air passage for air flow in contact with the material. The material is impregnated with an alkaline substance and a wetting agent. The alkaline material is preferably a hydroxide or carbonate of an alkali or alkaline earth metal. Suitable wetting agents are glycerine, ethylene glycol, and propylene glycol. The hygroscopic material may be paper, asbestos paper, cloth, or non-woven textile material.

39314 **APTIC NO. 61949**

Inventor not given

IMPROVEMENTS IN OR RELATING TO THE TREATMENT OF EXHAUST GASES. *(Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo, (Japan)) Brit. Pat. 1,326,602. 3p., Aug. 15, 1973. (Appl. Aug. 27, 1970, 12 claims).*

A catalytic structure for use in treating exhaust gases from the combustion engines of automobiles is described. The structure contains a catalyst active to purify internal combustion engine exhaust gases supported on a porous net like sheet made from yarns of heat resistant glass, each yarn comprising from 200 to 10,000 filaments each having a diameter of from 3 to 40 micron. The porous net like sheet has a mesh size of from 3.5 to 60, preferably from 8 to 32 mesh. The catalyst may be an oxide mixture which comprises an oxide of a transition metal, for example, nickel or cobalt, and an oxide of a metal which forms an acidic oxide, for example, chromium or manganese.

39315 **APTIC NO. 62021**

(Inventor not given.)

METHOD OF AND APPARATUS FOR CLEANING GASES. *(Technicair S.A., Vernier, (Switzerland)) Brit. Pat. 1,324,766. 6p., July 25, 1973. (Appl. April 19, 1971, 15 claims).*

A method and apparatus for cleaning gases contaminated by dust are described. The gas is forced through a passage with a constricted portion and defined by a liquid surface and a wall surface. The liquid is taken up by some of the gas and passes into a turbulent zone in which the gas becomes wetted throughout. Some of the wetted gas is returned into the passage through an opening in the wall surface and downstream of the constricted portion by venturi effect to wet that portion of the gas which passes through the passage without contacting the surface of the liquid. The apparatus eliminates the need for bulky and costly chambers and baffles. Power consumpiton is increased because pressure loss is cut down.

39316 **APTIC NO. 62022**

(Inventor not given.)

AIR CONTROL FOR WASTE INCINERATOR. *(Air Preheater Co., Inc., Wellsville, N. Y.) Brit. Pat. 1,324,747. 4p., July 25, 1973. (Appl. April 19, 1971, 7 claims).*

A waste incinerator for air control is described. It consists of a main combustion chamber having a waste charge opening to be closed by a door and with a combustion gas outlet leading to a stack in which a secondary combustion chamber is provided. A combustion air duct is connected to the main combustion chamber. Unburned gases produced in the primary combustion chamber are subsequently directed to the secondary combustion chamber where they are mixed with sufficient air and burned completely. Non-combustible exhaust gases alone are vented to the atmosphere.

39317 **APTIC NO. 62182**

Mitsubishi Metal Mining Co., Ltd. (Japan), Nippon Chemical Industrial Co., (Japan), and Mitsubishi Kokaoki Kaisha, Ltd. (Japan)

MON PROCESS, NEW NOX DISPOSAL TECHNIQUE DEVELOPED. *(NOx no shorigijutsu MON purosesu o kaihatsu). Text in Japanese. Preprint Japan Petroleum Inst., Tokyo, 5p., 1973. (Presented at the Japan Petroleum Institute Lecture Meeting on NOx Reduction, Tokyo, Japan, Aug. 29-30, 1973.)*

It is a wet denitrization process in which nitric oxide and nitrogen dioxide contained the flue gases from boilers and furnaces are removed by an alkaline additive such as a water solution of potassium permanganate which absorbs NO and NO2 described. A small-scale pilot plant test has revealed that the new process can efficiently remove and recover NO on an industrial scale. The main features of the new process include capability of removing and recovering NO on an industiral scale, simultaneous removal and recovery of sulfur dioxide, regeneration of the manganese dioxide formed in the waste absorbent for repeated use, ability to recovery alkali nitrate formed in the waste absorbent for use as fertilizer, and a closed circuit system which is completely free of pollutants emissions. Technically, the MON Process has been developed from the basic theory that absorption of NO by an alkaline water solution is made possible when the solution is reinforced with a strong oxidation power. The caustic soda solution used in a conventional denitrization process absorbs NO2, but not NO.

39318 **APTIC NO. 62292**

Hittman Associates, Inc., Columbia, Md.

ASSESSMENT OF SO2 CONTROL ALTERNATIVES AND IMPLEMENTATION PATTERNS FOR THE ELECTRIC UTILITY INDUSTRY. *Office of Science and Technology Contract OST-40, Rept. HIT-550, 146p., March 1973. 93 refs.*

NTIS: PB-224 119

Sulfur dioxide emission control technology available to electrical utilities in the time period 1970 to 2000 was assessed to quantify and interrelate the various control alternatives of naturally occurring low sulfur fuels, desulfurization technology, nuclear power, and advanced energy conversion and utilization techniques. All except utilization have the potential to make a significant contribution and achieve widespread commercialization by the utility industry. The need for commercially available and economically viable desulfurization technology is particularly acute if utilities are to comply with state and federal SO2 emission standards. A computer model was developed to assess the extent of compliance with SO2 regulations at both the regional and national level over the 1970-2000 time period. The model capabilities include variation of low sulfur fuels, rate of introduction of nuclear power generation, and the nationwide electrical energy requirement. Four cases were selected for investigation with the model, three for their national, and one for its regional implications. The results of these runs are included. A detailed assessment of desulfurization technology for SO2 control is included as is a compilation for each technological system of process description, state of development, process advantages and major problem areas, SO2 removal efficiencies, current process economics, and a developmental timetable for process commercialization.

39319 **APTIC NO. 62676**

California Legislature, Sacramento, Assembly Office of Research

CALIFORNIA STEAM BUS PROJECT. FINAL REPORT. *31p., Jan. 1973.*

The purpose of the California Steam Bus Project was to evaluate the technical feasibility and public acceptance of the external combustion Rankin cycle engine as a low-emission, quiet propulsion system, using city buses as demonstration vehicles. Three 40-foot steam buses were tested and demonstrated in the metropolitan areas of Oakland, San Francisco, and Los Angeles. The buses traveled 8372 road miles under steam power, including about 800 miles in revenue passenger service. Steam bus acceleration, top speed, and hill climbing were equal to or exceeded road performance of diesel buses. All steam buses were well below 1975 California emission standards for heavy duty vehicles, but none of the diesel buses came close to the meeting the requirements for hydrocarbons and nitrogen oxides combined. When the cleanest steam bus was compared to a composite of the cleanest diesels, the steam bus produced 30.5% less carbon monoxide and 86% less HC and NOx. The cleanest steam bus had 94% less NOx compared to the cleanest diesel. Steam engine fuel consumption was high. There was a potential for improved fuel consumption and more reductions of emissions. The steam engines had attributes needed in urban transportation and were accepted by the public. The steam engine should be continued to be studied, and improved.

39320 **APTIC NO. 62757**

WET COLLECTOR UPGRADED BY SIMPLE ADDITION. *Roads Streets, 166(9):138-139, Sept. 1973.*

The addition of a set of spray nozzles to a wet scrubber improved efficiency to meet more stringent air pollution control requirements. The emissions are now within code limits and no longer receive complaints. The scrubber is used at an asphalt paving and construction company near downtown Boise, Idaho in the batch plant. During an emission test of the facility after improvement of the scrubber, total particulate emissions were 34.4 lbs/hr at a process rate of 103 tons/hr. Since 90% of the particulates were less than 1.0 micron, visible emissions were greatly reduced.

39321 **APTIC NO. 62762**

(Inventor not given.)

PURIFICATION OF GASES OR VAPOURS. *(Establissement Aeromix, Vadux (Liechtenstein)) Brit. Pat. 1,321,735. 9p., June 27, 1973. (Appl. May 19, 1971, 22 claims).*

A process and apparatus for purifying gases or vapors by the electrostatic separation of solid particles and/or liquid particles and/or gaseous constituents are described. Two electrical phenomena together, namely the formation of an electrical dipole through induction (liquid droplet) and the existence of a non-uniform electrical field (electrically charging a body of limited spatial dimensions, either in the form of a particle or in the form of a gaseous constituent) cause the liquid droplet and particle to be attracted towards each other and to combine with one another. The liquid droplets do not have to be electrically charged which allows large quantities of industrial gases to be purified. Because large quantities of industrial gases can be purified, the requirements for expensive equipment to charge the liquid and the necessity of using a non-conductive liquid are eliminated. This expense is the major fault in other processes using electrostatic precipitators.

39322 **APTIC NO. 62764**

(Inventor not given.)

PRODUCTION OF SULPHUR FROM IRON SULPHIDE AND SULPHUR DIOXIDE. *(Sherritt Gordon Mines Ltd., Toronto (Ontario)) Brit. Pat. 1,321,515. 5p., June 27, 1973. (Appl. April 19, 1971, 9 claims).*

A hydrometallurgical process for producing elemental sulfur and ferrous sulfate by reaction of sulfur dioxide and artificial or natural pyrrhotites in an aqueous medium is described. The process utilizes waste SO2 fumes from metallurgical or other operations to produce elemental sulfur and is particularly adapted for use in circumstances where a supply of low cost pyrrhotite is available in proximity to the source of SO2. The reaction theoretically proceeds according to the following equation: FeS + (2 + x)SO2 + 2/3xH2O yields FeSO4 + (2 + 1/3x)S superscript o + 2/3xH2SO4 where x has any value in the range 0 to 3. The reaction is carried out in an autoclave or other suitable vessel equipped with agitation means at a temperature in the range of from 150-250 F. under a partial pressure of SO2 above 15 psig.

39323 **APTIC NO. 62781**

(Inventor not given.)

VENTURI SCRUBBER. *(Slick Corp., New York) Brit. Pat. 1,320,852. 5p., June 20, 1973. (Appl. April 20, 1971, 7 claims).*

A venturi scrubber was developed which overcomes the problem of extremely high abrasion which occurs at the region of the venturi throat in other scrubbers. There is a wall of ceramic blocks of high abrasion resistance at the gas flow region of the scrubber. The blocks have front exposed surfaces facing away from the venturi wall toward the axis and the back of the blocks facing toward the wall. The blocks are not formed with bores or any other cutouts extending between the front and rear surfaces, but are a continuous uninterrupted surface. This eliminates the abrasion and the need to prematurely replace the blocks.

39324 **APTIC NO. 62782**

(Inventor not given.)

IMPROVEMENTS IN DEVICES ADAPTED FOR THE INTRODUCTION OF AIR UNDER PRESSURE INTO THE EXHAUST PIPE OF VEHICLE INTERNAL COMBUSTION ENGINES. *(Societe Industrielle de Brevets et D etudes S.I.B.E., Neuilly-sur-Seine (France)) Brit. Pat. 1,321,139. 3p., June 20, 1973. (Appl. April 19, 1971, 3 claims).*

Improvements on devices which introduce air under pressure into the exhaust pipe of internal combustion engines are described. This device consists of an air pump driven by the engine which creates a supplementary demand of power which is always greater as the engine turns faster. This increases fuel consumption. These disadvantages are overcome by mounting a speed sensitive clutch between the engine and the air pump. This prevents the air pump being driven by the engine when it reaches a certain limit. At high speeds the air pump is automatically declutched. Both fuel consumption and wear of the air pump decrease.

39325 **APTIC NO. 62784**

(Inventor not given.)

DESULFURIZATION OF FLUE GAS. *(Consolidation Coal Co., Pittsburgh, Pa.) Brit. Pat. 1,323,931. 5p., July 18, 1973. (Appl. July 30, 1970, 10 claims).*

An improvement in the method of reducing the sulfur dioxide content of flue gas according to Brit. Pat. 1,191,427 is described. In that patent the flue gas in absorbed by sodium formate or potassium formate. The improvement or modification consists of conducting the reaction with sodium formate, potassium formate, or ammonium formate, in solution or in the molten form at a temperature above 140 F and below the decomposition temperature of the formate.

1972

39326 **APTIC NO. 61637**

August, Paul

INTERNAL COMBUSTION ENGINE EXHAUST AFTERBURNER. *(Nachverbrennungsvorrichtung fuer die Abgase von Brennkraftmaschinen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,114,981. 5p., Oct. 12, 1972. 3 refs. (6 claims).*

An internal combustion engine exhaust gas afterburner, composed of several catalyst chambers and one empty forechamber and afterchamber, each in a cylindrical housing, is described. The inside walls of the empty chambers are provided with baffles to promote the turbulence of the exhaust gases passing through the chambers. All the chambers have an annular cross section. At least one catalyst chamber and/or empty chamber peripheral walls includes an inlet on one side and an outlet on the other side. The cylindrical housing is enclosed by an annular space filled with metal or steel wool.

39327 **APTIC NO. 59539**

Barnard, Paul G., Aaron G. Starliper, Waldemar M Dressel, and Morris M. Fine

RECYCLING OF STEELMAKING DUSTS. *Bureau of Mines and IIT Research Inst., Proc. Miner. Waste Util. Symp., 3rd, Chicago, Ill., 1972, p. 63-68. 15 refs. (March 14-16.)*

Methods are described for upgrading steel furnace dusts to produce high-iron pellets for recycling. These dusts contain impurities such as zinc, lead, and copper which reflect the character of the feed to the furnace and the operation of the furnaces. Treatment procedures described include pelletization and reduction roasting to remove lead and zinc; sulfation with sulfuric acid or sulfur dioxide following by leaching to remove copper and zinc, and pelletization and reduction to remove lead and metallize the iron; pelletization of mixtures of dusts containing carbon, zinc, and lead following by roasting to eliminate these elements; and pelletization and roasting of mixtures of blast furnace dusts, basic oxygen furnace dusts, and mill scale. These methods were studied experimentally. Basic oxygen furnace dusts are particularly suitable for recycling. Although sulfatization and leaching can remove both Cu and Zn from electric furnace dusts, the potential rewards do not now warrant the effort. The extraction technology gives a product enriched with sulfur, which is undesirable. The electric furnace dusts are best treated with other steelmaking dusts which supplement each other by supplying iron and carbon units and diluting the copper. Blends of these materials processed by reduction-volatilization yield low-impurity, highly metallized pellets (85% Fe) which should be useful in any steel mill. (Author abstract modified)

39328 **APTIC NO. 62039**

Benedycki, J. and E. L. Cwieczek

THE REVIEW OF METHODS FOR DUST EXTRACTION FROM GASES DISCHARGED BY ARC FURNACES. *(Przeglad metod odpylania gazow z piecow elektrycznych lukowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(3):1-16, 1972. 10 refs.*

NTIS: TT 72-54023/3

The efficiency, cost, and mechanism of various methods for trapping, cooling, and de-dusting of gases generated during smelting in arc furnaces are discussed. Iron and other metal oxide dusts produced during the smelting of steel can be harmful to man, and therefore should be removed from the flue gas. Trapping methods include an intermediary procedure applied in small furnaces ranging from 1.5 to 10 tons using narrow hoods above the roof and direct methods in furnaces with a capacity above 10 tons using a fourth hole in the furnace roof. Gas cooling systems include mixing of gases with air sucked in from the surroundings, surface cooling in radiators or conduits, and cooling by direct contact with water. Fabric filters with synthetic fabrics, fiberglass and wet electrofilters, wet collectors, and mechanical collectors with venturi coagulators are used to de-dust gases from arc furnaces. Synthetic fabric bag filters are used to remove dust from electric furnaces. The design of these collectors and the material used in them are reviewed. Costs for various types of installations are listed.

39329 **APTIC NO. 61618**

Brandt, Herbert

EXHAUST PURIFIER. *(Abgasreinigungsanlage). Text in German. (Apparatebau Rothemuehle Brandt und Kritzler, Wenden (West Germany)) W. Ger. Pat. Appl. 2,238,790. 5p., Aug. 7, 1972. 1 ref. (2 claims).*

A flue gas purifier with a reheater is described. The flue gas to be purified by this wet method is first fed into a heat exchanger in which it heats air to at least 150-200 C. The reheating of the flue gases after purification in the lower part of the stack is ensured by an insert which forms a ring type feed channel used for the hot air passage. The air is introduced into the channel by tangential connectors or guides to impart a swirling action. The hot air, ultimately mixing with the purified flue gas, dries the latter and increases its temperature.

39330 **APTIC NO. 62707**

Cantwell, E. N., E. S. Jacobs, W. G. Kunz, Jr., and V. E. Liberi

CONTROL OF PARTICULATE LEAD EMISSIONS FROM AUTOMOBILES. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 95-107. 11 refs. (Oct. 31-Nov. 2.)*

Various trap systems for control of automotive exhaust particulates are reviewed along with new data on the total lead removal efficiency of lead traps for different size lead particles and lead emissions from production and trap-equipped cars driven in the unused Pennsylvania Turnpike tunnel. Test methods to measure exhaust particulate emissions are reviewed including a programmed chassis dynamometer, a total exhaust filter, a constant volume proportional sampler, impactors to measuring particle size, and an absolute filter sampler for measuring airborne lead emissions. The average total lead emission rate for production vehicles driven on the turnpike was 0.11 g/mi; the airborne lead emission rate was 0.05 g/mi, less than half the total amount emitted. Approximately 30% of the total amount of lead (0.031 g/mi) was greater than 9 micron in diameter; approximately 0.02 g/mi was 1-9 micron; about 0.031 g/mi was less than 1 micron in diameter; approximately 0.022 g/mi was below 0.3 micron in diameter. Air lead in urban areas has an average size of 0.25 micron in diameter. Cars driven with various trap systems reduced total lead by 82-91% of that from production vehicles. The traps also reduced the large sized particles by more than 90% and reduced the particles smaller than 0.3 micron by 71%. The traps reduced the amount of emitted airborne lead particles by 64-84%. Total emission control vehicles equipped with lead traps for particulate control and a gaseous emission control system consisting of a thermal manifold reactor and an exhaust gas recirculation system, reduced total lead by 85% and lead in the air in the turnpike tunnel by 71%, compared with production vehicles. Compact, effective lead traps using alumina pellets and cyclone collectors were developed which are suitable for replacement of mufflers on existing cars on the road. Lead traps are relatively simple and have no moving parts. Based on the reported tests, they do not deteriorate in effectiveness with mileage, require no maintenance, and should last the life of the vehicle.

39331 **APTIC NO. 62092**

Carlton, D. M., F. S. LaGrone, and J. D. Stuard

THE DEVELOPMENT OF AN NOX CONTROL STRATEGY FOR GAS-FIRED UTILITY BOILERS. *Air Pollution Control Association, Pittsburgh, Pa., Proc. Air Pollution Control Assoc., South Atlantic Sect., Fall Meet., Oxides Nitrogen Air Pollut. Technol. Meas. Control, Raleigh, N. C., 1972, p. 67-82. 1 ref. (Sept. 19.)*

A nitrogen oxides control strategy for gas-fired utility burners was developed to obtain the information required by an air pollution control agency for the development and promulgation of emission standards for NOx. All turbine generating units with maximum continuous steam capacity of 6,000,000 lb/hr or less will be excluded from specific control. All boilers designated as opposed-firing will limit emissions to .375 lb NOx/million Btu on an annual average basis and will not exceed an average of 0.7 lb NOx/million Btu during any continuous 2-hour period. All boilers designated as front-firing will limit emissions to .275 lb NOx/million Btu on an annual average basis and will not exceed an average of 0.5 lb NOx/million Btu during any continuous 2-hour period. All boilers designated as tangential-firing will limit emissions to

.175 NOx/million Btu on an annual average basis and will not exceed an average of 0.4 lb NOx/million Btu during any continuous 2-hour period. Boilers which are to have combustion modifications are to be operated according to procedures designed to minimize NOx emissions.

39332 **APTIC NO. 61677**

Chien, H.

SULFURIC ACID PLANT TAIL GAS ABSORPTION EXPERIMENTS. *(Liu suan kung ch ang huei chi si sou si tung shih yen hung ch ang yuen chiou). Text in Chinese. Kung ch eng (Eng. J.), 45(3):9-24, 1972. 5 refs.*

A pilot plant experiment was conducted to study flue gas absorption at a sulfuric acid manufacturing plant which produces 300 tons/day of H2SO4. The flue gas absorption apparatus consists of an absorbing tower and a decomposing tower. One fortieth of the total flue gas of 43,000 N cu m/hr, which contained as high as 0.13% of sulfur dioxide, was introduced into the absorbing tower from the bottom, and ammonium sulfite solution was sprayed from top of the tower. Ammonia gas was also introduced into the tower. The resulting solution was pumped to the decomposing tower which it was decomposed with concentrated H2SO4. The SO2 released was recycled to a drying tower for H2SO4 manufacturing. The polythionate, which is a by-product, was decomposed with hydrogen peroxide. More than 95% of SOx in the flue gas was effectively removed.

39333 **APTIC NO. 61678**

de Volo, N. B., R. E. Thompson, and D. P. Teixeira

THE EFFECTIVENESS OF COMBUSTION CONTROL IN REDUCING NOX FOR OIL FIRED POWER PLANT BOILERS. *Proc. Air Pollution Control Assoc. South Atlantic Sect., Fall Meet., Oxides Nitrogen Air Pollut. Technol. Meas. Control, Raleigh, N. C., 1972, p. 83-100. 2 refs. (Sept. 19.)*

The effectiveness of combustion control in reducing nitrogen oxides for oil fired power plant boilers is being investigated as a continuing program of the Southern California Edison Co. Off-stoichiometric combustion (by removing up to 25% of the burners from service) is one of the most effective means of NOx control and also one of the easiest to implement. The test data demonstrate reductions of 30-50%. The importance of burner spacing and mixing, boiler geometry, and other unit characteristics that dictate the necessity of individual unit by unit testing to obtain the maximum NO emissions reduction is evidenced by data from several units in the size range of 175 to 480 Mw. (Author conclusions modified)

39334 **APTIC NO. 62706**

Hallowell, J. B., R. H. Cherry, Jr., and G. R. Smithson, Jr.

TRACE METALS IN EFFLUENTS FROM METALLURGICAL OPERATIONS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 75-81. 3 refs. (Oct. 31-Nov. 2.)*

Current pollution control techniques associated with metallurgical operations are listed, and some examples of data are presented describing the behavior of trace metals in waste streams from smelting operations. The behavior of trace metals in gases and dusts at a combined copper-zinc smelting plant is given as an example. A flowsheet for the smelter and copper-zinc smelter waste stream characteristics are discussed. Initially, the kiln, roaster, and reverberatory furnace waste gases were treated in four electrostatic precipitator units in series. Converter gases were treated in a separate precipitator. In the altered arrangement, the roaster gases were treated in half the original precipitator capacity, and the reverberatory furnace gases were treated in the other half of the precipitator capacity. The reverberatory and converter gases flowed from their precipitators to a baghouse for additional dust recovery. Collection efficiency for particulates was initially 75% for the gases from dryers, roasters, and reverberatory furnaces. Collection efficiencies for the individual metallic elements varied from 40% for cadmium to 93% for antimony. When the roaster gas was segregated to half the original precipitator area, overall efficiency rose to 98.9%. The ratio of flow rate to precipitator area was decreased to about 40%, and the gas temperature decreased about 60 F. The general level of collection of the individual elements increased appropriately except for silver and cadmium, which were improved, but not to the levels of the other elements. Before and after data for the gas stream for the reverberatory furnace is also given. Trace metals in the copper smelting operation are reviewed. The system for cleaning smelter gases for acid plants typically consists of a waste heat boiler, a spray or tower scrubber using 30% acid, and one or more electrostatic precipitators for removal of particulates and demisting. The composition of acid plant water, estimated upper limits for constituents in gases entering acid plants, and the distribution of mercury in zinc ore roasting are mentioned.

39335 **APTIC NO. 62064**

Hycnar, J.

PROTECTIVE MEASURE AGAINST ATMOSPHERIC POLLUTION ENGENDERED BY DUMPS OF FURNACE REFUSE. *(Przeciwdzialanie zanieczyszczenia atmosfery przez skladowiska odpadow paleniskowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):35-42, 1972.*

NTIS: TT 72-54023/2

In many cases, dumps of furnace refuse constitute a potential source of atmospheric pollution. Laboratory and field experiments were conducted to find ways of preventing the dusting of fly ashes from furnace refuse by saturating or sprinkling them with oil-water emulsions. The most satisfactory results were obtained by sprinkling the surface of fly ashes with an oil-water emulsion with a 1:1 ratio of machine oil: water, about 4 kg/sq m. This emulsion gave complete protection against fugitive dust emission of the fly ash after a double coating. However, oil-water emulsions involve a drawback of worsening the conditions of biological reclamation of ash dumps, as well as of reducing the opportunities for utilizing the ashes for road and embankment construction.

39336 **APTIC NO. 62098**

Iinoya, K., K. Makino, and H. Masuda

DUST COLLECTING APPARATUS. *(Shujin sochi). Text in Japanese. Kagaku Kogaku, (Chem. Eng.), 36(8):803-810, 1972. 247 refs.*

A general introduction is given for the research activities on dust collecting apparatus including cyclone dust collectors, bag filters, fiber filters, filter papers, electrostatic precipitators, scrubbers, and eliminators. For cyclones, basic studies such as the analysis of turbulent flow are still being conducted, with the concentration on speed and static pressure distributions. For particles under 5 micron, the distribution caused by turbulent flow has contributed more to the separation than that caused by centrifugal forces. One example showed that the limit of average grain size for cyclone separation was 0.6 micron. Studies of bag filters are centered on their practical use including the characteristics of materials. Interesting results have been reported on the pressure loss of multichambered bag. Researches on fiber filters in Japan are concentrated on dust collecting mechanisms while those abroad are branched into many areas including the effects of fiber arrangement, load characteristics, of particulates and operating methods. The electrostatic precipitator receives the most attention. Thy researches are diversified in many areas including gas cooling, humidification, and the relationship between apparent specific resistance of particulate and temperature.

There are very few basic studies on scrubbers because the mechanism requires 3-dimensional analysis. However, there are many reports on the general characteristics such as pressure loss and efficiency. Eliminators for special chemical processes such as synthesis of methanol, sulfonation, and chlorination have been reported. There are also eliminators for sulfuric acid and phosphoric acid mists.

39337 **APTIC NO. 62016**

Kapczynski, J. and K. Generalczyk

INFLUENCES OF SULFURIC ACID PRODUCTION TECHNOLOGY ON THE EMISSION OF MIST. *(Wplyw technologii produkcji kwasu siarkowego na emisje mgly). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(1):27-33, 1972. 7 refs.*

NTIS: TT 72-54023/1

Most modern factories discharge sulfuric acid mist with stack gases at rates of 100 to 1000 mg/cu m which is much greater than the maximum allowable annual concentration of 0.1 for areas under protection or 0.05 mg/cu m for areas under particular protection. Mist formation is conditioned by the occurrence of the critical supersaturation of vapor. The greater the supersaturation, the smaller and more numerous the mist particles. Owing to the high molar mass, a low rate of diffusion of vapors, and the high temperature of the dew-point, the sulfuric acid vapor is exceptionally liable to yield mist. For this reason, prevention of mist formation in processes of production of sulfuric acid is difficult, especially in manufacturing H2SO4 by the wet catalysis method. Mist production during manufacturing of H2SO4 by the wet catalysis method can be reduced by raising the temperature of the cooling water to reduce the violent cooling of the postcontact gas. Nitroso production of H2SO4 produces a lot of mist which can be reduced by feeding more concentrated acid of a higher temperature to the denitrating tower for sprinkling, but these measures interfere with the output. Mist formed during drying of gas can be reduced by using acids of a concentration below 98% and a corresponding low temperature. To reduce mist formation caused by the presence of water vapor in gas, an adequately high temperature can be maintained in the bottom part of the absorber and temperature can be brought down in steps to attain condensation of the H2SO4 vapors on droplets of the spraying acid. But since it is not possible to totally eliminate mist formation, it will be necessary to remove the mist which is discharged.

39338 **APTIC NO. 62096**

Kapczynski, J. and K. Generalczyk

METHODS FOR REMOVAL OF MIST FROM WASTE GASES DISCHARGED ON THE PRODUCTION OF SULFURIC ACID. *(Metody usuwania mgly z gazow odlotowych przy produkcji kwasu siarkowego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):43-53, 1972. 24 refs.*

NTIS: TT 72-54023/2

Sulfuric acid mist characteristics are described. The most efficient method of trapping H2SO4 mist in an electrostatic precipitator which can give an efficiency of over 99% at a rate of flow of the gas of 1 m/sec, and at a 4/sec hold up time. Wet, wire-in-tube electrofilters are most efficient. Fibrous filters can also remove H2SO4 mist. Three types of fibrous mist eliminators are the highly effective mist eliminator which uses Brownian movements and gives 100% efficiency for particles less than or equal to 3 micron and 95-99% with particles less than 3 micron, the high-velocity mist eliminator which uses collision and gives 100% and 90-98% efficiencies, and the catch-drop which uses collision and gives 100% and 15-30% efficiencies, respectively. Gauze filters are made of a mat (thickness 50-200 mm) comprising several filter fibers. Different gauze filters have different sizes, densities of filtration layer, surface areas, and free volumes. Effectiveness of mist trapping is basically affected by the rates of gas flow and the properties of filters. The gauze filters are designed for trapping particles above 2 micron in size. Several types of gauze filters are described, and experiments on their ability to remove H2SO4 mist are reviewed. Other types of mist eliminators are mechanical devices such as cyclones, foam washing machines, ceramic filters, venturi scrubbers, ultrasonic agglomeration, bed filters, and rotary filters. In general, gauze filters are the most economical method.

39339 **APTIC NO. 61609**

Merckle, Karl Erwin

WET ELECTROSTATIC PRECIPITATOR FOR AIR AND WASTE GASES. *(Nass- Elektroabscheider zum Reinigen von Luft und Abgasen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,047,210. 5p., April 6, 1972. 11 refs. (6 claims).*

A wet electrostatic separator for the purification of air and waste gases is described. The separator constitutes a standing pipe widening upward conically, with an axially located corona electrode which uses the interior surface of the pipe wall as the counterelectrode. The distance between the corona electrode and the counterelectrode decreases in upward direction. The inlet and outlet orifices of an abruptly reduced cross section relative to the pipe diameter are located in the bottom and top end walls, respectively, with the gas flow in an upward direction. An annular trap channel for trickling liquid is on the outlet end face, with its floor surface surrounding the pipe outflow opening, forming a baffle to produce a damming zone in the pipe. The liquid can be fed into the pipe to flow countercurrent to the gas, forming a continguous film on the inner surface of the pipe. Identical units of this type of electrostatic precipitator can be superimposed or mounted in horizontal series.

39340 **APTIC NO. 61937**

Miyabe, Hideya

REDUCTION OF NOX AND CO IN EXHAUST EMISSIONS BY CATALYSTS. *(Shokubai niyoru haiki gasu chu no NOx oyobi CO no teigen). Text in Japanese. Nippon Jidosha Kenkyujo Knekyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 10:343-349, Sept. 1972.*

Nitrogen oxides and carbon monoxide were treated by copper-base metal whiskers supported by a metallic web and the catalytic activity was investigated as a function of space velocity and air to fuel ratio. The catalyst consists of copper-base whiskers 2 to 10 mm long and a few micron in diameter duplexed with nickel and is supported by a 304 stainless steel web of 12 micron diameter wires. A 4 cycle single cylinder gasoline driven engine was operated at a constant speed of 3000 rpm and regular grade gasoline was used in the tests. The composition of the exhaust emission was obtained as a function of air to fuel ratio and a maximum NOx concentration of 2000 ppm was obtained at A/F 14. The conversion of NOx was found to be high at A/F 13 and gradually decreased when the theoretical air to fuel ratio is approached. The space velocity was increased up to 200,000/hr and the decrease in NOx conversion was found to be small. The stainless web showed considerable catalytic activity at high temperature and superposition of catalytic activity by the web and the catalyst itself can be expected. Secondary air blowing enhnaced CO conversion while decreasing NOx conversion. It is concluded that oxygen inhibits the conversion of NOx. A durability test of the catalyst at a space velocity of 50,000/hr, 600 C, and A/F 13 using leaded gasoline showed no catalyst degradation after 945 hr. The catalyst can be used for simultaneous conversion of NOx and CO in a single catalyst bed.

39341 **APTIC NO. 62214**

Nishida, Konosuke

ODOR POLLUTION CONTROL. *(Akushu bogai no boshi gijutsu). Text in Japanese. Kyoto Univ. (Japan), Dept. of Sanitary Engineering, 214p., April 1972. 5 refs.*

This compendium of information concerning odor includes discussions on: the physiological apparatus and mechanism of odor sensitivity, classification methods for odors, odor measurement methods by the body, odor control laws, the effects of odor on various physical systems, odorous emission sources, odor-forming chemical actions, bad odor measurement methods by physical methods and sensitivity methods, odor control methods, examples of odor control in Kraft Pulp Mill ozone treatment, fishmeal factories, petroleum refining industries, sewage treatment plants, incinerators, and a bacterial chemical factory. Related data are presented in diagrams, graphs, and tables. Ammonia, low class amines, low class aliphatic acids, hydrogen sulfide, mercaptans, sulfides, high class amine lipids, can be controlled with scrubbers using showers, packed towers, or wet screens. The ozone-masking method is effective for nonsaturated organic compounds, hydrogen sulfide, mercaptan amine, and aldehyde sulfide. Direct combustion at 800 C or above is effective for petroleum refining and lipid fat factories. Catalytic oxidation is effective for hydrocarbons. Adsorption by activated carbon, silica gel, and activated white clay is effective for alcohol, fat, acids, benzene, or mercaptans, and petroleum. The air oxidation method by heat exchanger or cooler is effective for hydrogen sulfide, and the soil oxidation method is effective for ammonia and amines. The ion-exchange resin is effective for sewage treatment plants.

39342 **APTIC NO. 61607**

Renard, B.

FOR A BETTER ENVIRONMENT IN FRANCE, II. *Fr.-Am. Commer., 1970:11- 13, 33, July-Aug. 1972.*

The sources and control of air pollution by French industries are discussed. Most industrial efforts have been directed towards dust control which can reach 90%. Methods of purification of gases are much less advanced. Efforts are being directed towards changes in processes which would eliminate or reduce the emissions. A washing process limits the gas emissions produced by aluminum electrolytic manufacture and another washing process reduced the emissions from plants manufacturing sulfuric acid and allows for the recovery of 90% of the sulfur. The improved technique of recovering dust from the plants of composed fertilizers achieved by washers and retrievers also permits the recovery of various products which may find a market. Several nitric acid production processes possess efficient solutions to limit dangerous gas emissions. A mining process based on the infusion of water under pressure greatly reduced dust emissions. An almost total suppression of gas emissions was achieved by charging glue paste kilns. The substitution of pitch agglomerates by means of distillation and oxidation processes helps to reduce pollution. Sulfur oxide emissions are being controlled from some natural gas process plants. Heating is another important source of air pollution in France and technical advances in the design of equipment as well as regulations have resulted in a nearly 50% reduction in pollution in the Paris area from dwellings and apartment houses. (Part I processed as APTIC 61606.)

39343 **APTIC NO. 61631**

Santiago, Andres and Enrique Santiago

CATALYST BODY FOR THE CLEANING OF INTERNAL COMBUSTION ENGINE EXHAUST GASES, AND PROCEDURE FOR ITS MANUFACTURE. *(Katalysatorkoerper zur Reinigung der Abgase von Brennkraftmaschinen und Verfahren zur Hertsellung dieses Katalysators). Text in German. (Zeuna-Staerker KG, Augsburg (West Germany)) W. Ger. Pat. Appl. 2,213,540. 4p., March 21, 1972. 1 ref. (4 claims).*

A device for the catalytic purification of internal combustion engine exhaust gases, and a procedure for the preparation of the heat-resistant casing are described. The device is composed of a catalyst support with a large specific area on which the catalyst material is applied, and a casing of incombustible casing enclosing the catalyst support. The casing is composed of a layer of mineral wool embedded in a heat-resistant binding material, another layer of steel wire mesh reinforcement also embedded in heat-resistant binding material, and a third layer of embedded mineral wool.

39344 **APTIC NO. 62062**

Sarna, M.

DYNAMICS OF OSCILLATION-EXCITING BEAMS OF ELECTROFILTER- COLLECTORS. *(Dynamika belek wzbudzajacych drgania w elecktrodach zbiorczych elektrofiltrow). Air Conserv. (English translation Polish of: Ochrona Powietrza), 6(1):34-40, 1972. 14 refs.*

NTIS: TT 72-54023/1

During electrostatic precipitation of dust, dust is removed from the electrodes by oscillations caused by the axial impact of a shift hammer to the exciting beam which in turn excites oscillation in electrodes. The attempts to determine stresses and velocities at the side of the beam, on the spot where the impact is received, and in the beam are discussed. Analytical coverage is given of the resilient longitudinal stroke of the shift hammer imparted to the oscillation-exciting beam of the electrofilter. Results are given of the stresses and velocities at the end and at other parts of the rod, performed on the assumption that the impact is locally resilient. Results of the measurements of stresses are compared with the calculated results.

39345 **APTIC NO. 62346**

Schopf, Paul S.

AN EXPERIMENTAL INVESTIGATION OF ACOUSTI PRECIPITATION OF AEROSOLS AT MODERATE SOUND INTENSITY. *Brown University, Providence, R. I., Div. of Engineering, Bureau of Mines Contract H0111398, Rept. BuMines OFR 48-73, 39p., Nov. 1972. 6 refs.*

NTIS: PB-222 755

The possible use of medium energy acoustic fields (130 to 140 dB) to precipitate 1 to 10 micron particles was investigated. The aerosol was produced with a LeMer generator using oleic acid and nitrogen. The sound field was a sinusoidal standing wave field in an acrylic tube, with light transmission data used for concentration determination. The results showed collection efficiencies of up to 80% on 2 micron particles with a residence time of 11.8 sec at a sound pressure level of 139 dB re .00002 N/sq m. The possible turbulent mechanism is discussed and compared with other studies. (Author abstract modified)

39346 **APTIC NO. 61617**

Wilm, Diederich, Willi Flasskamp, Eduard Broft, and Kurt Jordan

SOLIDS SEPARATOR FOR AEROSOLS. *(Anlage zur Abscheidung von Veststoffen aus Aerosolen). Text in German. (Deutsche Gold- und Silber-Scheideanstalt vormals Roessler, Frankfurt (West Germany)) W. Ger. Pat. Appl. 1,607,694. 5p., April 6, 1972. 9 refs. (7 claims).*

Equipment for the separation of solids, e.g., soot and pigment, from aerosols with high dew point temperatures of 130-150 C is described. The equipment is composed of a series of cyclones for coarse particle separation, and a series of filter chambers with bag filters for fine particle separation. The filter chambers and their pipings and control organs are heated to maintain the operating temperature in excess of the dew point temperature.

39347 **APTIC NO. 62296**

Zalisz, A.

DISPOSAL OF FLYING ASHES IN MEDIUM-SIZE INDUSTRIAL HEATING PLANTS. *(Odbior pylow dymnicowych w cieplowniach przemyslowych sredniej wiel-*

kosci). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(4):9-15, 1972.

NTIS: TT 72-54023/4

The disposal of fly ash in medium-sized industrial heating plants is discussed, including suggestions for dealing with the problem. The main difficulty is lack of procedure. The filled bins cannot be transported in open trucks and there is at present no special purpose truck for conveyance of flay ash. The ashes cannot be dumped at municipal dumping grounds since this may cause secondary dust pollution of the surroundings. Fly ash from heating plants is not as a rule carried away at present and sometimes because of this, costly dust collecting installations in perfect order are kept idle. Ashes could be mixed with wet slag to adequately limit possible secondary dusting if only during transportation to the dumping ground. A boiler signaling and blocking installation should be adopted in the case of inefficient dust collecting operation of cyclones.

39348 **APTIC NO. 61005**

Mitsubishi Chemical Industry Co. (Japan), Kurosaki Factory

AN OUTLINE OF A SULFUR-REMOVAL PROCESS FOR COKE-OVEN EFFLUENT. *(Kokusu-ro gasu no datsuryu purposesu no gaiyo). 1972 (?). Translated from Japanese, 7p.*

A COG sulfur-removal process developed by Mitsubishi Chemical and Mitsubishi Chemical Engineering is reviewed. The process eliminates the colloidal sulfur by-product and gives a simpler disposal of the liquid effluent. A pilot plant with a coke oven gas (COG) capacity of 3000 N cu m/hr was set up, and tests were carried out for a year. The COG is washed with ammonia to eliminate the tar and naphthalene. Then it is sent to an absorption tower where hydrogen sulfide is absorbed by ammonia obtained from the gas. The liquid then enters a reclamation tower where the H2S is stripped with steam. The reclaimed liquid is transferred back to the absorption tower where it is reused. Since the stripped gas contains no ammonia or hydrogen cyanide, sulfur can be recovered with a high degree of purity. The results of experiments on the pilot plant, special technical features of the process, and plant specifications are reviewed.

39349 **APTIC NO. 61627**

(Inventor not given.)

CLEAN COKE QUENCHING FUMES BY USING DUST CATCHING NOSES FITTED IN THE SLOT OF THE QUENCHING TOWER. *(Vorrichtung zur Schmutz- und Wasserabscheidung aus den Loeschschwaden in Koksloeschtuermen). Text in German. (Fa. Carl Still, Recklinghausen (West Germany)) W. Ger. Pat. Appl. 2,100,848. 4p., Sept. 7, 1972. 3 refs. (2 claims).*

An increased rate of dust removal from coke quenching fumes generated by coke quenching towers is obtained by arranging dust catching noses on the flanges on top of the serrated slates of a dust catching louvre box and noses on the flanges set underneath the serrated slates in different directions. The louvre boxes are roof-shaped with the coping in the center of the slot of the quenching tower. The noses are preferably made from polypropylene or polypropylene-containing materials. The reduction in dust is from 400 g/ton coke to 63 g/ton coke against 113 g/ton with previous methods. The high efficiency may be due to the steam formed during quenching which generates an inhomogeneous electrostatic field on the polypropylene noses.

39350 **APTIC NO. 61697**

Organisation for Economic Co-operation and Development,
Air Management Research Group

FACTORS INFLUENCING RESEARCH POLICY ON DESULPHURIZATION RESEARCH. *In: Air Management Problems and Related Technical Studies. p. 99-104, 1972.*

Processes for the reduction of sulfur emissions and factors influencing research policy in that area are discussed. Almost all processes for the desulfurization of flue gases are in a development stage, and not yet applied in large scale operation. There is no process for which economic data are yet adequately established on a basis of intensive full scale operation. A commercial plant for the desulfurization of residual fuel oil is in operation. Its relative cost may be comparable with that which can be achieved by flue gas desulfurization. Two new processes are under study in which desulfurization takes place during the combustion process: combustion of coal in a fluidized bed and gasification under pressure with oxygen or air. The processes which offer the prospect of lower costs are dependent on the solution of technical problems or alternatively involve high capital expenditure.

39351 **APTIC NO. 61698**

Organisation for Economic Co-operation and Development,
Air Management Research Group

FLUE GAS DESULPHURIZATION PROCESSES. *In: Air Management Problems and Related Technical Studies. p. 105-112, 1972.*

Processes for flue gas desulfurization are evaluated. Major problems associated with each process are included and material costs and capital costs are estimated. The processes include: dry injection of limestone or dolomite; dry injection--wet scrubbing; scrubbing with calcium oxide/water, Bahco scrubber CTB; scrubbing with potassium sulfite; addition of ammonia followed by scrubbing; adsorption on sodium aluminate; dry manganese oxide process; Bergbau-Forschung char process, thermal regeneration; Bergbau-Forschung char process, regeneration with water; catalytic oxidation to sulfuric acid; and catalytic reduction to sulfur.

39352 **APTIC NO. 61700**

Organisation for Economic Co-operation and Development,
Air Management Research Group

PROCESSES FOR THE REMOVAL OF PYRITES FROM COAL. *In: Air Management Problems and Related Technical Studies. p. 117-131, 1972. 7 refs.*

Processes for the removal of pyrites from coal that are being investigated in the United States, United Kingdom, USSR, and Germany are described. The physical separation process given preference in the U. S. is wet density separation which suggests itself owing to the considerable differences in the density of pyrites and of coal. R. E. Zimmerman has proposed three methods which are based on removing the mineral matter from coal by charging it in a jigging machine. In the United Kingdom, no investigation into the particle size distribution of pyrites in major British coal seams has been published. Among the process proposals and equipment developments which have been published is the one by Ross and Young. In the USSR and the East Bloc countries, the number of publications dealing with a reduction of the sulfur content is very large. Most of the work deals with a reduction of the S content of coking coals and not with the removal of S from power station coals. The processes used are wet gravity separation and centrifugals of different types, flotation, and dry magnetic separation after thermal pre-treatment. Efforts in Germany have centered on the desulfurization of intergrown layers of coal in sizes of more than 1 mm; the removal of S from raw slurries; and the removal of S from pulverized coal.

39353 **APTIC NO. 62010**

Atomic Energy Commission, Synthetic Fuels Panel

HYDROGEN AND OTHER SYNTHETIC FUELS: A SUMMARY OF THE WORK OF THE SYNTHETIC FUELS PANEL. *Rept. UC-80, 135p., Sept. 1972. 60 refs.*

NTIS: PB-224 482

Synthetic fuels from nonfossil sources were studied as alternatives for supplying the long term needs for gaseous and liquid fuels. The selected fuels include hydrogen obtained from water and synthetic fuels containing hydrogen as ammonia, hydrazine, methanol, and related substances. Hydrogen has outstanding potential as a fuel for the transportation sector because of its unique, nonpolluting character. The applications would initially be for fleet-operated trucks and buses, high-speed trains, and aircraft, and may later entend to private automobiles. Methanol was identified as an attractive near-term automotive fuel. While not as clean burning as hydrogen, it is superior to gasoline and would more readily fit into existing vehicle designs and fuel logistics systems, although its relatively low heating value and boiling point imply changes in on-board storage concepts. The conversion of agricultural and urban wastes to synthetic fuels could supply a significant fraction of the 1985 shortage of pipeline gas, probably at costs competitive with imports. (Author summary modified)

39354 **APTIC NO. 62215**

Olson Labs., Inc., Anaheim, Calif.

ANALYSIS OF EFFECTIVENESS AND COSTS OF RETROFIT EMISSION CONTROL SYSTEMS FOR USED MOTOR VEHICLES. VOLUME I. SUMMARY. (FINAL REPORT). *Office of Air Programs Contract 68-04-0038, Rept. 71Y233, Rept. APTD-1335, 138p., May 1972.*

A summary is presented of the results of a program which examined the effectiveness and costs fo retrofit methods for control of emissions from gasoline-powered, light-duty used automobiles. Reliable crankcase blowby control systems appear to reduce up to 20% of all the hydrocarbon emitted by cars without any emission controls, with conventional crankcase control systems costing up to $40.00 installed. Evaporative control devices appear capable of reducing hydrocarbons emitted from an uncontrolled car by as much as 20% also; cost of a used car retrofit evaporative control is estimated at $140.00 maximum. Exhaust emission control devices such as air bleed to the intake manifold, catalytic conversion, ignition timing modification with lean idle adjustment, and exhaust gas recirculation appear capable of reducing hydrocarbons by a pooled mean reduction percentage of 12-68; carbon monoxide reductions range from 31-63%, and nitrogen oxide reductions range from minus 5-48%. Catalytic conversion appears to offer the best reductions for both hydrocarbons and carbon monoxide and is matched in effectiveness only by exhaust gas recirculation for NOx. Initial cost of a catalytic conversion system is $175.00, while ignition timing modification and exhaust gas recirculation have initial costs of $45.00 and $89.00 respectively. Cost of the air bleed system appears to range between $56.00-$64.00, though one system evaluated reportedly costs about $23.00.

1971

39355 **APTIC NO. 60320**

Fletcher, Ronald S. and Richard D. Siegel

THE CONTROL OF OXIDES OF NITROGEN EMISSIONS FROM AIRCRAFT GAS TURBINE ENGINES. VOLUME 2: THE NOX FORMATION PROCESS. (FINAL REPORT). *Northern Research and Engineering Corp., Cambridge, Mass., Federal Aviation Administration and Office of Air Programs Contract DOT FA70WA-2428, Rept. FAA-RD-71-111-2, 144p., Dec. 1971. 18 refs.*

NTIS, DDC: AD 741506

A study was undertaken to develop criteria for use in the design of aircraft gas turbine combustion chambers to minimize nitrogen oxide emissions. The approach adopted involved the development of a mathematical model of NOx emission from aircraft engine combustors; a parametric analysis, using the model, to determine the sensitivity of NOx emissions to variations of model parameters and engine design variables; evaluation of critical model parameters by means of experimental measurements; and the incorporation of the model into combustor design methods to provide guidelines for minimizing NOx emission while maintaining other performance and emission characteristics. Volume 2 of the study is solely concerned with the nitric oxide formation process; it presents a mathematical description of the process, a full description of the computer program NOXRAT for calculating thermodynamic data, and a section which is essentially a user s manual for the program. The program is based upon a six-reaction model of NO formation. (Author abstract modified)

39356 **APTIC NO. 61610**

Haarer, Erich, Ernst Fuerst, and Otto Buddenberg

CARBON DIOXIDE AND HYDROGEN SULFIDE REMOVAL FROM GASES. *(Verfahren zur Abtrennung von Kohlendioxyd und Schwefelwasserstoff aus Gasen). Text in German. (Badishe Anilin- und Soda-Fabrik AG, Ludwigshafen (West Germany)) W. Ger. Pat. Appl. 1,571,754. 2p., March 25, 1971. (1 claim).*

A process for the removal of carbon dioxide and/or hydrogen sulfide from gases, such as natural, synthetic, town, coke, water, and industrial gases, is described. The gases are scrubbed with N-(omega-methoxy)-alkyl-pyrrolidones with 1 to 6, and preferably 1 to 4, carbon atoms in the alkyl radical under pressure, after which the solvent is degassed by complete or partial release of pressure. The CO2 and H2S concentrations in the gases above can be reduced to below 0.1% by volume by this process. These solvents have a good Bunsen absorption coefficient, hence good solvent power for CO2 and H2S, and therefore subsequent scrubbing with water is usually unnecessary. The solvents have high thermal stability, cannot be saponified, have favorable viscosity and boiling points, and are non-volatile.

39357 **APTIC NO. 62205**

Hays, Gilbert A.

HYDROCARBON RECOVERY FROM AUTOMOTIVE EXHAUST. *Army Logistics Management Center, Texarkana, Tex., Army Material Command Intern Training Center Rept. USAMC-ITC-2-71-05, 64p., July 1971. 15 refs.*

NTIS, DDC: AD 768 144

The source and control of the three major air pollutants emitted by the automobile are discussed as they related to the Otto cycle engine. Emissions from the vehicle without any emission control devices are released in the exhaust, and from the crankcase, the fuel tank, and the carburetor. The engine exhaust accounts for practically all of the carbon monoxide and nitrogen oxides, as well as more than half of the hydrocarbon emissions. The formation of these pollutants during the engine s combustion process is a function of such factors as air-fuel ratio, intake-manifold vacuum, engine compression ratio, ignition timing and quality, engine speed and load, fuel distribution between cylinders, fuel distribution within a cylinder, coolant temperature, combustion chamber configuration, the cleanliness of the engine, and the condition of wear of the engine. The emissions may be termed: blowby emissions, evaporative emissions, and exhaust emissions. The recycling all of the blowby gases back through the engine will eliminate all of the crankcase emissions. Evaporative emissions can be controlled with a vapor recovery system and the adsorption regeneration system. The proposed exhaust control system consists of five major subsystems: refrigeration unit, heat exchanger, liquid-gas separator, recovered liquid storage container, and a catalytic converter.

39358 **APTIC NO. 61615**

Ionescu, Vasile C.

AIR CLEANER FOR MERCURY VAPOR CONTAMINATION. *(Vorrichtung zur Reinigung von mit Quecksilberdampf verunreinigter Luft). Text in German. (Institutul de Cercetari si Proiectari Automatizari si Proiectari Uzine si Instalatii Pentru Industria Electrotehnica, Bucharest (Ru-*

mania)) W. Ger. Pat. Appl, 2,122,002. 3p., Nov. 25, 1971. 2 refs. (1 claim).

Equipment for the wet separation of mercury vapors from air is described. The equipment includes a contact chamber with a spray nozzle system in its upper part for the distribution of an adsorbent liquid, a 10% solution of sodium sulfide. The contact psace upper surface is larger than the lower cross section. The droplet separator with baffles, as well as the exhaust duct, are separated from the contact space by filters. The adsorbent liquid is circulated by a pump.

39359 **APTIC NO. 61611**

Ioos, Ernst

SCRAPER FOR DUST LAYER REMOVAL FROM THIN DIAPHRAGM-LIKE CELLULOSE ESTER FILTER LAYER. *(Kratzvorrichtung zum Abschaben des Staubkuchens von einer membranartig duennen Filterschicht). Text in German. (Bergwerksverband GmbH, Essen (West Germany)) W. Ger. Pat. Appl. 2,007,499. 7p., Sept. 16, 1971. (7 claims).*

A scraper for dust layer removal from thin diaphragm-like cellulose ester filter layers are used for the dry dedusting of air and gases is described. The scraper is resiliently mounted in the direction of engagement, has a sharp, indentation-free blade, and is inclined in the direction of the movement of the filter layer. The filter layer is tightly tensioned, at least in the scraper region, and is supported by an elastic underlay, preferably of foam rubber made of plastic foam with open pores and low flow resistance.

39360 **APTIC NO. 61629**

Pepperl, Hans and Wilhelm Ruehl

FLUE GAS AFTERBURNER IN THE FLUE GAS DUCT. *(Im Rauchgaskanal zur Nachverbrennung von Rauchgasen angeordnete Vorrichtung). Text in German. (Krauss-Maffei AG, Munich (West Germany)) W. Ger. Pat. Appl. 2,029,168. 5p., Dec. 23, 1971. 6 refs. (5 claims).*

An afterburner for the reliable and highly efficient afterburning of flue gases in flue gas ducts is described. The afterburner is in the form of a conically converging chamber with a tangential secondary air feed opposed to the flue gas flow in the narrowest cross section region. The air flows radially outside the chamber in helical paths and enters the afterburning chamber through an annular gap formed by the wide end of the tapering afterburning chamber and the cylindrical wall of the secondary air space surrounding the afterburning chamber.

39361 **APTIC NO. 61047**

Saeufferer, Helmut

CATALYTIC REMOVAL OF NITROGEN OXIDES, HYDROCARBONS AND CARBON MONOXIDE FROM COMBUSTION ENGINES EXHAUST GASES. *(Verfahren zum katalytischen Entfernen von Stickoxiden, Kohlenwasserstoffen und von Kohlenmonoxid aus den Abgasen von Brennkraftmaschinen). Text in German. (Daimler-Benz AG, Stuttgart (West Germany)) W. Ger. Pat. Appl. 1,594,699. 2p., Jan. 7, 1971. 2 refs. (3 claims).*

A process for the two-step catalytic removal of nitrogen oxides, hydrocarbons, and carbon monoxide from internal combustion engines exhaust gases is described. In the first stage, the exhaust gas is treated internally for the catalytic reduction of nitrogen oxides, while the second stage is used for the oxidation of hydrocarbons and CO in the presence of external air. A chromate catalyst, preferably barium-copper chromate, is used for the reduction stage, while the oxidation of hydrocarbons and CO takes place in the presence of tricobalt tetroxide or supported platinum catalyst.

39362 **APTIC NO. 61622**

Storp, Klaus, Kurt Kaul, Horst Biewald, Wilhelm Krah, and Leo Weck

DEVICE FOR THE SEPARATION OF HYDROGEN SULFIDE AND CARBON DISULFIDE FROM OXYGEN-CONTAINING GASES. *(Vorrichtung zur Abscheidung von Schwefelwasserstoff und Schwefelkohlenstoff aus Sauerstoff enthaltenden Gasen). Text in German. (Metallgesellschaft AG, Frankfurt (West Germany)) W. Ger. Pat. Appl. 1,952,346. 6p., April 29, 1971. 4 refs. (1 claim).*

A device for the removal of hydrogen sulfide and carbon disulfide from oxygen-containing gases, composed of two superimposed adsorber containers, is described. Both containers are filled with iodized activated carbon and are connected by a duct with a shut-off element. The containers are brick-lined in the lower parts, while the upper one has a jacket of corrosion-resistant material over the bricks, forming an annular chamber with the outer wall which can be acted on by heaters. The lower adsorber container is filled with activated carbon with an iodine content of 0.25-1.5%, preferably 1%, and with predominant pore radii comprised of 6 and 8 A. The upper container is filled with hydrophobic activated carbon with predominant pore radii between 4 and 5 A.

39363 **APTIC NO. 62011**

Stout, Bruce G.

SELECTION OF AIR POLLUTION CONTROL EQUIPMENT. *Army Logistics Management Center, Texarkana, Tex. Product/Production Engineering Program, Training Center Rept. USAMC-ITC-2-71-12, 82p., July 1971. 13 refs.*

NTIS, DDC: AD 768 115

Air pollution control equipment manufacturers were surveyed and a computerized cost model was developed to select the optimum piece of air pollution control equipment for a given situation. The development of the annual cost equation is illustrated for a generalized pollution control system for particulates. The selection procedure for equipment is based upon three cost models which combine to give a total yearly equipment cost. The first model is based on costs associated with cooling requirements. Fan expenditures and power costs are used in the second model. The third function is based on gas stream flow rate and includes equipment operating costs. These are contained in a computer program which allows an exhaustive analysis in a matter of minutes. The data needed for the model along with the computer program for its manipulation are included.

39364 **APTIC NO. 62222**

Wood, B.

COMBINED CYCLES: A GENERAL REVIEW OF ACHIEVEMENTS. *Inst. of Mechanical Engineers, London (England), Steam Plant Group and Koninklijk Inst. van Ingenieurs (Netherlands), Mod. Steam Plant Pract., Proc., Gravenhage, Netherlands, 1971, p. 75-86, 125-147. 21 refs. (April 28-30, Paper C76/71.)*

The combination of gas turbines with steam plants is reviewed historically, and efficiency, design, recuperation cycles, selection of a gas turbine, relationship of the two cycles, alternative fluids to steam, and future prospects are reviewed. Combined cycles were used first in the Velox boiler and later in two different ways described as the high-efficiency combined cycle and the recuperation cycle. The first way can in principle be applied to any steam plant, irrespective of steam conditions, and shows a gain of about 5% on heat rate over the highest steam plant efficiencies. The gas turbine, if properly matched to the boiler, is usually 15-20% of the steam turbine output. Gas is the preferred fuel for the gas turbine, but the boiler may burn any fuel. The plant is best suited to high load factor duties. In the pure recuperation cycle, a waste-heat boiler produces steam from the heat in the gas turbine exhaust. The condensing steam turbine is limited to low steam conditions, and about 50% of the gas turbine output. Efficiency is markedly improved. Supplementary fuel burned in the exhaust can raise steam conditions and increase steam output, but at the expense of falling cycle efficiency and increasing complexity of the boiler. Gas is the usual fuel, but any clean fuel is acceptable if low enough in price. Plant cost is moderate, and performance is suited to middle load factor duties. The relationship between the two cycles and the question of transition between them is discussed by the aid of a new diagram. Minor variations are possible within each type, but a clear distinction is to be made between the two basic types, especially in capital cost. (Author abstract modified)

39365 **APTIC NO. 61623**

(Inventor not given.)

SEPARATION OF SULFUR COMPOUNDS FROM AIR, WASTE GASES, AND PROCESS GASES. *(Verfahren zur Entfernung von Schwefelverbindungen aus Abluft, Verbrennungsgasen und Produktionsgasen). Text in German. (Chemengineering Co., Ltd., Zug (Switzerland)) W. Ger. Pat. Appl. 1,956,197. 3p., June 9, 1971. 1 ref. (6 claims).*

A process for the removal of sulfur compounds, such as hydrogen sulfide, mercaptans, and carbonyl sulfide from vent air, combustion gases, or process gases is described. The gases to be purified are contacted with 0.01-50% aqueous solution of metal chelate complex compounds, such as sodium bi-beta-hydroxyethyl-glycinate, diethylenetriaminopentaacetic acid, or beta-hydroxy methyliminoadiacetic acid in the presence of iron or copper in the form of turnings, gauze, or molded articles in a temperature range of 0-100 C and under normal or increased pressure. Oxygen in a concentration of over 0.3% is added to gases containing little oxygen for the oxidation of the sulfur compounds.

1970

39366 **APTIC NO. 61616**

Behrens, Milton Daniel

INTERNAL COMBUSTION ENGINE EXHAUST CONTROL. *(Abgaseinrichtung an Brennkraftmaschinen). Text in German. (Texaco Development Corp., New York) W. Ger. Pat. Appl. 1,751,799. 4p., Aug. 27, 1970. 13 refs. (2 claims).*

An exhaust gas catalytic afterburner and a device to protect the catalytic material from overheating in the afterburning chamber are described. The cylindrical afterburner chamber has a fresh air inlet with a heat protector shield for the afterburner with the catalyst. The afterburner downstream includes a backpressure valve and the housing includes an inner pipe of the same diameter as the exhaust pipe with an end piece of reduced diameter close to the exhaust pipe in the upstream direction. The entire length up to the reduced section is perforated. The overheating protection device allows rapid heating of the catalyst to the required temperature at a low exhaust gas flow rate, and it protects the catalyst against excess heat at high exhaust gas flow rates by admitting part of the exhaust gas into the annular space formed by the inner pipe and its cylindrical wall enclosing the inner pipe.

39367 **APTIC NO. 62788**

Herrmann, Erich

A METHOD OF PURIFYING THE EXHAUST GASES FROM THE INCINERATION OF REFUSE. *(Metallgesellschaft Aktiengesellschaft, Frankfurt-on- the Main (Germany)) Brit. Pat. 1,176,637. 4p., Jan. 7, 1970. (Appl. Feb. 16, 1968, 10 claims).*

A method of purifying the exhaust gases from the incineration of refuse is described. The method permits the gases to be purified and their heat to be recovered at the same time. Both the exhaust gas and sedimentary sludge are purified in a multiple hearth furnace. The gases can be further treated for dust removal by an electrostatic precipitator. The gases leave the furance at temperature between 200 and 350 C which is below the acid dew point. This eliminates the corrosion problems of other processes and allows for the dust-collecting plant to be constructed from ordinary materials that are available at an economical price.

39368 **APTIC NO. 58207**

Vickers, Paul T.

UNCONVENTIONAL POWER PLANTS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Air Pollution Control Assoc., Mid-Atlantic States Sect., Semi-Annu. Tech. Conf. Transp. Impact Air Pollut., Harrisburg, Pa., 1970, p. 49-52, 83-90. (Oct. 8-9.)*

Several General Motors test vehicles are discussed using fuel cells, storage batteries, gas turbines, steam engines, and Stirling engines. Problems and advantages of these alternative power plants are described. At the present time, it is unclear as to whether any of these can do the complete transportation job with lower emissions than spark ignition engines.

1969

39369 **APTIC NO. 61634**

Curchod, Jaques Monts

WET SCRUBBER FOR GASES. *(Vorrichtung zum Nassreinigen von Gasen). Text in German. (Curchod, Baeriswyl and Cie. S.A., Rolle (Switzerland)) W. Ger. Pat. Appl. 1,920,376. 4p., Dec. 4, 1969. 5 refs. (3 claims).*

A wet scrubber for the separation of dust from gases, composed of a housing with a cover, a suction pump, baffles, and baffle plates to prevent obstruction of the gas stream entering the wash liquid is described. Baffle walls arranged on both sides of the gas inlet opening have baffle plates which converge in the flow direction to form a chamber which tapers both horizontally and vertically between two outlet openings. Preferably the baffle walls are in two parts; an upper part seated on the housing cover, and a lower part in the liquid container. The height of the baffle plates is adjustable as a function of the liquid level in the container.

39370 **APTIC NO. 61016**

Luchesi, M.

THE DRY QUENCHING OF COKE. *(L extinction a sec du coke). Technica Assoc. of the French Steel Industry Commissions of Engineers, Commission for Coking Plants, Rept. 10 C.I.T., p. 2211-2225, 1969. Translated from French, 25p.*

Two years of operation of a dry quenching coking plant operation at Homecourt, France, are reviewed. The plant uses the Sulzer method to transmit the latent heat of the coke to a heat exchanger by means of a gas circulating in a closed circuit, successively in contact with the coke and with the walls of the exchanger. The temperature of the inert gas at the exchanger discharge point is conditioned by that of the steam under the conditions of pressure desired. It is possible to recover 70 to 75% of the latent heat of the coke or 28 to 34% of the heat expended for heating the furnaces. The Homecourt facility and the recovery boiler are described. Dusts and harmful gases are removed at the instant of discharge for 4 to 5 min every 12 min, or for about 40% of the time. The dust removal installation allows the daily recovery of 10 to 12 tons of absolutely dry and granular coke. The Homecourt coking plant dry quenches, on the average, 98% of its production. The total dry quenched coke accounts for 42,300 tons. The mean production of steam is 0.44 tons/ton of total dry quenched coal. Gases at the blower output consist of a low amount of oxygen, 6.4-25% carbon monoxide, 4.3-12.3% carbon dioxide, and a maximum of 6% hydrogen. Danger from these gases is eliminated by keeping the system completely shielded and gastight. Dry quenching is an effective means for combating atmospheric pollution by the almost total obviation of wet quenching, when effective dedusting of the dry coke handling installations occurs. System costs are cited.

39371 **APTIC NO. 57372**

Meijer, Roelof Jan

PHILIPS STIRLING MOTOR: HOT-AIR ENGINE WITH DEVELOPMENT POTENTIAL. *(Philips Stirling-motor: varmgasmotor med utvecklingsmojlisheter). Text in Swedish. Tek. Tidskr., 30(99):373-378, April 1969.*

Research produced a freezing unit which operated on cold gas since 1955. There are additional usages of the Stirling system in the field of engines. The Stirling engine uses a thermodynamic process with four stages: compression, heating, expansion, and freezing. The basic difference between the Stirling engine and other internal combustion engines is that heat is added and subtracted through heat exchange and the working fluid remains in the motor at all times. The method of exterior heat generation, used since 1954, decreases risk or dangerous gases. The engine can use stored heat and be driven by sun or atomic energy. The engine is silent and vibrates little. Air in the closed system of the Stirling engine was replaced by hydrogen and helium and the first larger engine developed 40 hp at 2500 rpm with a power output (liter-effect) of 110 hp and a maximum efficiency of 38% when measured at the engine axle. Twenty independent variables were successfully programmed into a computer to optimize power and efficiency. Engine life is at least 10,000 hr at full load, assuming that normal 18-8 steel is used, at 700 C and at an average pressure of approximately 110 kp/sq cm. The Stirling engine is an important contribution toward decreasing air pollution.

1967

39372 **APTIC NO. 58087**

Lovell, Harold L.

RECOVERY OF PYRITES FROM COAL REFUSE--A PILOT PLANT STUDY. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, 15p., 1967. 3 refs. (Presented at the Rocky Mountain Minerals Conference, Las Vegas, Nev., Sept. 6-8, 1967.)*

A research study was conducted to characterize the materials contained in coal refuse banks. From these data, a refuse processing flowsheet was evolved and a small plant designed, constructed, and operated with the objective of removing organic combustibles from the coal refuse. The goal was to achieve a gravity separation resulting in a clean secondary refuse. Data thus acquired relating to the production and characteristics of pyritic concentrates from coal refuse is presented and tables are given. A proposed flowsheet for beneficiation of a bituminous coal refuse to achieve a pyrite concentrate would include initial sizing to about minus 1 inch with removal of the minus-28-mesh material. The 1-inch by 28-mesh material would be separated at a gravity between 1.60-1.80 to yield a low-grade steam coal. The secondary refuse would be further reduced to about 0.25 inch with subsequent heavy media separation at a gravity of about 2.70. The original minus-28-mesh refuse would be subject to a combination of hydrocyclone-sieve band-flotation separation to yield further clean coal. The heavy gravity fine fractions would be combined with the 2.70 sink fraction for tabling. The pyrite concentrate would finally be tabled to yield a grade product. The table tailing could be ground to minus 48 mesh and subjected to flotation for further pyrite recovery. By recovering pyrite from coal, the coal would have a reduced sulfur content and would produce less air pollution when burned.

1966

39373 **APTIC NO. 62840**

Braeuser, Hans Werner and Friedrich Fischer

PROCESS FOR PROTECTION OF ACTIVATED CARBON IN THE PURIFICATION OF VISCOSE WASTE GASES. *(Verfahren zum Schutz der Aktivkohle bei der Reinigung von Viskoseabluft). Text in German. (Bamag Verfahrenstechnik GmbH, Dutzbach (West Germany)) W. Ger. Pat. Appl. 1,669,508. 7p., May 26, 1966. (3 claims).*

The grain disintegration activated coal caused by the extraction of elemental sulfur from viscose waste gases can be reduced to the layer of activated coal in which the hydrogen sulfide is oxidized to elemental sulfur. After some time, when the grains of this layer begin to disintegrate, the entire layer is drawn off and replaced by activated coal from the carbon disulfide adsorption zone. The activated coal that is drawn off is liberated from all disintegrated matter. The loss is replenished by fresh activated coal. The regenerated activated coal is then returned to the head of the adsorber.

39374 **APTIC NO. 61632**

(Inventor not given.)

STREET AIR PURIFICATION. *(Grossanlage zum Reinigen der Strassenluft). Text in German. (G. A. Messen-Jaschin, Sarnen (Switzerland)) W. Ger. Pat. Appl. 1,303,721. 4p., April 22, 1966. 1 ref. (4 claims).*

A large-scale system for purifying the polluted air in streets using fans which extract the air through manholes into the drains is described. Each fan is mounted in the main sewer outside the sewer cross-section and above a siphon formed by a partition which dips into a pit in its center below the sewer level. This leaves the effluent passage unimpeded but acts as a lock for the normal air passage. In this manner it is avoided that fans counteract each other. Both the sewage and the polluted air flow in the same direction in the sewer. Hydrocarbons present in the polluted air are readily condensed at the low temperature prevailing in the sewer, and the concentration of nitrogen oxides is reduced by solution in the sewage along the flow path.

1965

39375 **APTIC NO. 61062**

Lauff, H. P.

DUST EXTRACTION FROM BASIC OXYGEN FURNACES WITH SUPPRESSED COMBUSTION. *Stahl Und Eisen (Duesseldorf), 85(7):391-397, 1965. 8 refs. Translated from German, 19p.*

Early operating experiences are reported for a suppressed combustion basic oxygen furnace dust extraction plant. The extraction system consists of a gas cooler, a primary precipitator, and an annular gap scrubber. The steam produced is used for heating purposes. The formation of slag and iron skulls in the gas collecting hood was prevented by design modification. Special precautions taken to insure safe burn-off of carbon monoxide in the bleeders of stacks comprised the installation of three ignition burners in each bleeder opening. The burning of furnace gases in a soaking pit plant is planned for the future.

39376 **APTIC NO. 61061**

Remmers, K.

DUST EXTRACTION FROM CUPOLAS BY MEANS OF VENTURI TUBE SCRUBBERS. *Giesserei (Duesseldorf), 52(7):191-193, April 1, 1965. 2 refs. Translated from German, 11p.*

Wet dust extraction from cupola gases by means of a venturi tube are considered, and a layout is given for an acid cold blast cupola. Dust content measurements reveal a mean separation efficiency of about 98%; a better separation may be possible with clean circulating water (larger settling pond). Measured results are compared with calculations from an equation drawn up for the degree of separation in venturi scrubbers and show good agreement. The formula must be extended by means of a correction factor if recirculated water is injected into the venturi tube and into the saturator. A separation of 97.9% is obtained for the venturi tube installation tested by applying the correction factor and agrees almost exactly with the measured result of 98%. Layout, measured and calculated separation values, and design considerations are also given for a venturi plant extracting dust from a hot blast cupola. Capital investment and operating costs are tabulated for both cold blast and hot blast cupolas.

39377 **APTIC NO. 61059**

Simon, R.

PLANNING AND CONSTRUCTION OF THE DUST EXTRACTION EQUIPMENT OF A BASIC OXYGEN STEEL PLANT AND INITIAL OPERATING EXPERIENCE. *Stahl Eisen (Duesseldorf), 85(7):385-391, 1965. 6 refs. Translated from German, 20p.*

Considerations leading to the final selection of a dust-extraction installation for a basic oxygen steel plant are reviewed along with initial operating experience. Topics reviewed include: controlled versus suppressed combustion; the merits and drawbacks of waste-heat boilers; waste-gas temperature; dew point and combustability of the gas; construction of a plant with extraction of leakage gas; a gas collecting hood; a waste-gas duct with hot cooling; wet dust extraction; and steam-discharge valves with low noise levels. Initial difficulties experienced include: skull formation in the stack from ejected materials; difficulties with hoods such as material ejected from the furnace being impinged against the outer hood and drawn into the suction gap; explosions at the water separator and the horizontal waste gas pipe between the chimney and prescrubber; and accretions in the dust extraction plant. A review is given of the prospects of improvements in a new plant to be constructed for another furnace and the most favorable design for extraction without combustion and gas recovery.

1961

39378 **APTIC NO. 57968**

Ross, H. U.

ROASTING IN THE IRON AND STEEL INDUSTRY. *Can. Mining Met. Bull. (Montreal), 64(8):609-614, Aug. 1961. 8 refs.*

The most obvious application of roasting in the iron and steel industry is for treatment of pyrite (FeS2) and pyrrhotite (Fe11S12). The roasting of pyrite can be studied from three points of view. In the first, the pyritic ore would be treated for its iron content only, and the sulfur discarded. Secondly, the ore might be treated for its sulfur content, iron being a by-product. Thirdly, the pyritic ore itself may be a by-product of some other metal such as nickel or copper. Sulfur can be eliminated from ferrous materials at a number of stages. It can be removed in the refining of steel, but this is difficult and expensive. It can be removed more successfully in the blast furnace by use of the proper basic slags which absorb sulfur. The best way to remove the sulfur is by roasting before smelting. This is usually accomplished by sintering. Where the sulfuric acid demand is sufficiently high or where there is no convenient source of acid, it may be advantageous for a steel plant to manufacture its own from the recovered SO2.

1956

39379 **APTIC NO. 57974**

Pigache, Pierre Gustave

PROCESS FOR THE DRY PURIFICATION OF SULPHUR-CONTAINING GASES. *(Assignee not given.) Brit. Pat. 743,172. 5p., Jan. 11, 1956. (Appl. May 7, 1951, 6 claims).*

A process for the separation and recovery of sulfur or its compounds from sulfur-containing gases is described. The crude gases are contacted at a temperature of 100 to 300 C with a fixing agent of finely divided copper or a copper oxide, thus forming a copper-sulfur compound. The catalyst is regenerated by heating it to 350 to 850 C and submitted to a stream of air followed by a stream of hydrogen-containing gas. The copper-sulfur compound is transformed into an oxidized compound evolving 1/2 the sulfur contained as sulfur dioxide. The remaining compound is reduced to copper or a copper oxide, evolving SO2 or carbonyl sulfide, depending on the reducing gas used. The SO2 or COS obtained during the regeneration of the catalyst can be treated to produce elemental sulfur or valuable sulfur compounds. The gas that can be treated by this process include coal gas, producer gas, flue gases, smelting gases, or any other sulfur-containing gases.

MEASUREMENT METHODS

1974

39380 **APTIC NO. 62817**

Archimbaud, M., J. Brun, and R. Rzekiecki

SULFUR DIOXIDE CONCENTRATION MEASUREMENT BY MEANS OF DRY SUBSTRATE. *ATMOSPHERIC DIFFUSION OF SULFUR DIOXIDE. (Mesure des concentrations de SO2 par une methode sur support sec. Diffusion du SO2 dans l atmosphere). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 36-1-36-15. 7 refs. (May 8-10.)*

Methodology and equipment using a dry substance for the measurement of sulfur dioxide concentrations in the air, for the study of the diffusion of SO2 emissions, and for identification of SO2 emission sources are described. Air sampling is done at a rate of 8 cu m/hr for 1 hr by means of an Autonomous Air Sampler (DIAPAT) provided with a Whatman No. 1 paper filter previously impregnated with potassium hydroxide containing glycerol. The filter sample is then analyzed colorimetrically in an auto-analyzer. The air sampling rate is 23 cm/sec, with the total filter area being 95 sq cm. The sensitivity of the method is 15 micrograms/cu m SO2. Other pollutants, such as hydrogen sulfide, hydrofluoric acid, and nitric oxide do not interfere with the SO2 determination. In principle, it is possible to develop similar dry supports for the determination of the latter pollutants.

39381 **APTIC NO. 61755**

Bertsch, Wolfgang, Ray C. Chang, and Albert Zlatkis

THE DETERMINATION OF ORGANIC VOLATILES IN AIR POLLUTION STUDIES. CHARACTERIZATION OF PROFILES. *J. Chromatographic Sci., 12(4): 175-182, April 1974. 40 refs.*

An analytical method is described in which trace quantities of organic volatiles collected from urban environments are adsorbed on a porous polymer of high temperature stability. The trapped substances are subsequently heat desorbed and transferred to a short precolumn which is kept at subambient temperature. Separation is effected by gas chromatography with efficient capillary columns. Almost 100 compounds, mostly alkanes and substituted aromatic hydrocarbons, were identified. Other substances found in trace quantities were aldehydes and chlorinated hydrocarbons. Volatiles eluting before benzene can be determined only qualitatively since displacement occurs by less volatile substances with increasing sample size. Profiles established over a period of 18 months are remarkably constant for samples collected in urban environments. (Author abstract modified)

39382 **APTIC NO. 61858**

Beyermann, K. and W. Eckrich

DIFFERENTIATION OF THE AEROSOL BOUND AND GASEOUS FRACTIONS OF INSECTICIDES IN AIR. *(Trennung des Insecticidgehaltes der Luft in den Aerosolgebundenen und den gasfoermigen Anteil). Text in German. Fresenius Z. Anal. Chem., 269(4):279-284, 1974. 3 refs.*

To differentiate the fraction of pesticides that is adsorbed to dust particles from the fraction that is vaporized, air samples are filtered by means of glass fiber filters. The air passing through these filters contains the vaporized insecticides. To collect this fraction the air is passed over stainless steel nets which are covered with polyethylene glycol 400. Nets prepared in such a way can also be used to collect both aerosol bound and free insecticides from air. Fifteen samples of air were investigated. The fraction of vaporized insecticides is several times greater than the fraction bound to dust particles.

39383 **APTIC NO. 62827**

Biles, B., C. Brown, and T. Nash

AC REFLECTOMETRY: A SENSITIVE METHOD OF MEASURING SMOKE OR REACTIVE GAS IN AIR. *J. Phys. E., vol. 7:309-313, 1974. 5 refs.*

An AC reflectometric method is described for the sensitive determination of smoke or reactive gases such as hydrogen sulfide after sampling for times of the order of 10 min. The difference in reflectance between neighboring soiled and unsoiled regions of a filter is converted into an AC signal which is then amplified, rectified, and displayed on a meter. Sensitivity is limited by the noise signal given by unexposed filters, though such noise is low for membrane filters, resulting in high sensitivity to smoke or any gas capable of giving a color reaction on a suitably treated surface. The instrument can be calibrated for use without any knowledge of the absolute sensitivity by taking samples in parallel with samples for a standard reflectometer.

39384 **APTIC NO. 62793**

Bonometti, G.

AUTOMATIC AIR POLLUTION MONITORING NETWORK IN THE LACQ INDUSTRIAL AREA. *(Reseau de mesures automatique de la pollution sur le site de Lacq). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Pollueces, 11th, Paris, France, 1974, p. 6-1-6-5. (May 8-10.)*

The automatic air pollution monitoring network established around the natural gas-processing plant at Lacq (France) is described. The plant emits waste gases containing, on an average, 0.005% hydrogen sulfide, 0.60% sulfur dioxide, and 10% carbon dioxide. The sampling stations have been sited as a function of the action radius of SO2 as determined mainly from plant damages around the industrial plant. The SO2 concentrations are measured continuously by means of PICOFLUX and PHILLIPS instruments, and also the wind speeds and wind directions are recorded. The measurement data are sent to a central computer for data processing, where the actual SO2 concentrations are permanently compared with the maximum allowable concentrations. Whenever the SO2 concentration exceeds the maximum allowable value for a certain number of minutes, the plant is given a signal to reduce its emission by a given percentage.

39385 **APTIC NO. 62411**

Brachaczek, Wanda and W. R. Pierson

ANALYTICAL METHOD FOR MEASURING SBR TIRE DEBRIS IN THE ENVIRONMENT. *Rubber Chem. Technol., 47(1):150-160, March 1974. 4 refs.*

An analytical method was developed for measuring suspended particulates collected on filters and analyzing them for rubber particles from rubber tire wear. The procedure consists of determining styrene-butadiene rubber (SBR) by measurement of the absorbance in the infrared spectrum at 10.35 and 14.3 micron. Large samples, quite opaque to infrared radiation, must be collected in order to obtain a detectable amount of SBR in the air. This necessitates a separation of SBR from the bulk of the material prior to measurement. The amounts of SBR to be separated are commonly in the submilligran range, constituting perhaps 0.1% of the sample. The method used for separation is extraction with hot orthodichlorobenzene in an oxygen-rich environment. Then the rubber hydrocarbon styrene-butadiene copolymer is analyzed by infrared spectroscopy in the extract. The procedure overcomes serious difficulties due to the small amounts of rubber normally encountered and due to the losses of SBR during extraction from aerosol samples. The method and some applications are discussed in detail.

39386 **APTIC NO. 62423**

Bremner, J. M. and W. L. Banwart

IDENTIFYING VOLATILE S COMPOUNDS. *Sulphur Inst. J., 10(1):6-9, 17, Spring 1974. 21 refs.*

Recent work has shown that volatile sulfur compounds are produced through microbial transformations of soil sulfur compounds, and thus, significant gaseous loss of sulfur may occur from soils through microbial production of volatile sulfur compounds. Gas chromatographic procedures that have proved satisfactory for identification of these volatile sulfur compounds are described. The procedures can separate and identify trace amounts of mercaptans, alkyl sulfides, and other volatile sulfur compounds released from soils or produced by microorganisms. The 15 compounds studied were sulfur hexafluoride, hydrogen sulfide, carbonyl sulfide, sulfur dioxide, methyl and ethyl mercaptan, dimethyl sulfide, carbon disulfide, ethyl methyl sulfide, n-propyl mercaptan, iso-butyl mercaptan, diethyl sulfide, n-butyl mercaptan, dimethyl disulfide, and diethyl disulfide. The chromatographic techniques invovled the use of Teflon columns packed with commercially available material and of a flame photometric detector fitted with a sulfur filter. Specifficity, sensitivity, interference tests, and applications of the methods are discussed.

39387 **APTIC NO. 62809**

Brion, J.

DEVELOPMENT OF A PROBE FOR DUST EMISSION CONCENTRATION MEASUREMENT AT HIGH FLOW RATES. *(Mise au point d une sonde equilibree a large gamme de vitesses pour les mesures des concentrations de poussieres a l emission). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 25-1-25-10. 3 refs. (May 8-10.)*

An equilibrated dust sampling probe for high-speed gas streams is described. Isokinetic sampling is achieved by the use of an internal and an external pressure inlet. With the pressures occurring at the internal and external pressure inlets, the gas flow speed in the probe equals that in the gas duct. The deviation from isokinetic sampling amounts to less than 5% for the highest flow speed of 3 m/sec.

39388 **APTIC NO. 62861**

Brockman, Philip and R. K. Seals, Jr.

ANALYSIS OF LASER MEASUREMENT OF HIGH-ALTITUDE AIRCRAFT EMISSIONS. *AIAA (Am. Inst. Aeronaut. Astronaut.) J., 12(5):651-655, May 1974. 20 refs.*

(Presented at the American Institute of Aeronautics and Astronautics. Fluid and Plasma Dynamics Conference, 6th, Palm Springs, Calif., July 16-18, 1973, Paper 73-704.)

Accurate prediction of the environmental impact of stratospheric aircraft requires highly sensitive and specific measurement of effluents which have long residence times and possible catalytic interactions with the ambient atmosphere. Calculations were performed to analyze three narrow bandwidth tunable laser measurement techniques for high altitudes where molecular absorption lines are narrow. Two-ended absorption measurements using state-of-the-art tunable diode lasers can provide sensitivities of approximately equal to 0.02-0.2 ppm over 10 m for ozone, carbon monoxide, nitric oxide, water, and sulfur dioxide with minimal interference effects. Heterodyne radiometry of radiation from a hot near wake is capable of measuring initial wake concentrations, while heterodyne radiometry of absorption of solar radiation is sensitive to less than 0.01 ppm of NO and CO in the far wake. These heterodyne measurements, with tunable diode laser local oscillators, will require development of milliwatt per mode diode lasers. Remote (1 km) resonance fluorescence measurements using dye lasers are capable of measuring to 0.15 ppm nitrogen dioxide. Sensitivities can be improved to close to ambient levels during wake penetration. (Author abstract)

39389 **APTIC NO. 62797**

Cartigny, S.

COMPARISON OF THE CRITERIA OF NOXIOUSNESS OF MINE DUSTS AS ADOPTED IN DIFFERENT MEMBER COUNTRIES OF EEC. *(Comparaison des criteres de nocivite des empoussierement miniers adoptes dan differents pays de la Communaute). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Inst. Atmos. Polluees, 11th, Paris, France, 1974, p. 11-1-11-7. (May 8-10.)*

Statistical analyses of mine dust concentration measurement data obtained by konimeter, tyndalloscope, thermal precipitator, and Staser apparatus were performed to determine the equivalent noxiousness as determined by the four different methods. The Kendall test of the distribution of the qualifications good and non-acceptable gave a correlation coefficient of 0.499, while the Cochran test revealed good homogeneity of qualifications good and non-acceptable at a probability of 50%.

39390 **APTIC NO. 62156**

Chiba, Atsushi

MICRODETERMINATION OF COPPER IN ATMOSPHERIC PARTICULATES BY A RING OVEN TECHNIQUE. *(Ringu obun-ho ni yoru taikichu fuyu ryushijo busshitsuchu no do no teiryo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 23(3):237-241, March 1974. 12 refs.*

The ring oven technique was applied to separate, concentrate, and determine copper in atmospheric particulates which were collected at a rate of 20-30 l/min with a membrane filter. The technique consisted of a portable glass ring oven, a bath liquid of 100 ml water, and a temperature of 90 C. Iron, aluminum, chromium, cobalt, manganese, magnesium, nickel and calcium were removed by using 25 microliters and 30 microliters of 0.05 N hydrochloric acid; copper sulfide was not dissolved. Copper was developed in a ring form with 15 microliters of 0.28% ammonia water and a further addition of 20 microliters. The best color was obtained when 1 vol % buffer of pH 5.0 was added to a chloroform and acetone solution of 0.1 wt % bathocuproine and 2 wt % hydroquinone. The same results were obtained in the pH range of 4 to 7. The detection limit of copper in a disc was 0.005 micrograms and the determination range was 0.01 to 3.0 micrograms. Determination takes about 10 min and the ranges of errors by the technique are within 5% compared with spectrophotometric methods.

39391 **APTIC NO. 62816**

Chuong, B. T., A. Nanat, and S. Zakartchenko

CONTRIBUTION TO THE MEASUREMENT OF AMMONIA CONCENTRATION IN AIR BY THE INDOPHENOL METHOD USING DRY SUPPORTS. *(Contribution a la mesure d l ammoniac dans l air par la methode d ! indophenol avec utilisation des supports secs). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 35-1-35-14. 3 refs. (May 8-10.)*

A method for the measurement of ammonia concentrations in the air by sampling on dry support and subsequent evaluation by the indophenol method in a TECHNICON auto-analyzer is described. Sampling is done at a rate of 1 l/min on a glass-fiber filter previously impregnated with sodium nitroprussiate as a catalyst, phenol, sodium citrate, sodium hypochlorite, and glycerin. No interference due to sulfur dioxide, nitrogen dioxide, hydrogen sulfide, and iron was observed. When present in a concentration five times that of the ammonia, H2S and formaldehyde interfered with determination. The ammonia retained in the filter is transformed into ammonium sulfate, and is eluted by washing with lukewarm water. The samples can be stored for several days before determination.

39392 **APTIC NO. 62543**

de Veer, S. M.

HOW TO MEASURE AMBIENT POLLUTION. *Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 27(364):129-133, March 1974. 6 refs.*

The measurement of ambient pollution and criteria for selection of a measurement method are discussed. Efficient control is only possible if the control loop process-measurement-control is closed and all three factors are working optimally. Adequate pollution control requires good continuous measurement. Because continuous field measurements are usually performed at a point remote from an operator or data processor, extra reliability of the monitors is required. Automatic calibration, representative sampling, proof against environmental influences, and automatic data transmission are necessary. Situational examples by air pollution monitoring are given. The application and the costs of measuring are discussed. (Author summary modified)

39393 **APTIC NO. 62413**

Eagan, M. L. and L. Dubois

THE DETERMINATION OF AMMONIUM ION IN AIRBORNE PARTICULATES WITH SELECTIVE ELECTRODES. *Anal. Chim. Acta, 70(1):157-167, May 1974. 12 refs.*

The accurate and rapid measurement of ammonium ion in airborne particulates is described, with particular reference to so-called high-volume air samples collected on glass-fiber filters. The method involves aqueous extraction of a part of the filter followed by analysis with a selective electrode; an Orion ammonia electrode and a Beckman ammonium electrode were compared. Varying ionic strength of the sample extracts had no effect and small interferences by other elements with the Beckman electrode could be taken into account. For a typical air sample of 2000 cu m, the ammonium content could be determined accurately down to 0.03 micrograms/cu m. The accuracy was established by comparison with an absorptiometric method. Recovery of standard added ammonium was quantitative. Three different methods of extraction were compared. (Author summary)

39394 **APTIC NO. 62316**

Ellison, A. H.

PROGRESS IN INSTRUMENTATION AND TECHNIQUES FOR MEASUREMENT OF AIR POLLUTANTS. *Environmental Protection Agency, Research Tri-*

angle Park, N. C., Office of Research and Development, Program Element 1AA010, Rept. EPA-650/2-74-015, 22p., Jan. 1974. 46 refs.

NTIS: PB-231 568

Instrument and techniques for the measurement of air pollutants are summarized. Included are the techniques and instrumentation that have been promulgated by the Environmental Protection Agency along with air pollution standards, those that are in use by EPA for developing standards, and those that are being developed by EPA to meet current or future needs. Descriptions of these techniques are brief, but reference to the detailed procedures are given. The techniques cover the measurement of the following pollutants: particulate matter, sulfur oxides, nitrogen oxides, photochemical oxidants, hydrocarbons, carbon monoxide, hydrogen sulfide, mercury, beryllium, and asbestos. (Author abstract modified)

39395 **APTIC NO. 62792**

Folz, Jean-Martin

THE ROUEN AREA AIR POLLUTION MONITORING AND ALARM NETWORK. *(Le reseau de surveillance et d alarme pour la prevention de la pollution atmospherique dans l agglomeration rouennaise). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 5-1-5-11. (May 8-10.)*

The air pollution monitoring network and its operation in the Rouen area (highly susceptible for the occurrence of high pollutant concentrations due to unfavorable meteorological conditions) is described. The network continually measures sulfur oxides, nitrogen oxides, hydrocarbons, dust, and ozone concentrations. Apart from pollution monitoring, the network is used for the prediction of periods of peak concentrations, and for the release of alarms for the principal emission sources. An alarm is given during the coincidence of specific critical concentrations of different pollutants. Since it was not possible to find valid correlation between the periods of pollution and the occurrence of specific meteorological conditions, periods of high pollution are predicted on the basis of actual measurement data, earlier pollution and meteorological records, and actual meteorological forecasts.

39396 **APTIC NO. 62578**

Fritz, James S. and Richard C. Chang

MACROPOROUS RESINS FOR SORPTION AND CHROMATOGRAPHIC SEPARATION OF GASES. *Anal. Chem., 46(7):938-940, June 1974. 12 refs. (Presented at the American Chemical Society, National Meeting, 166th, Chicago, Ill., Aug. 31, 1973.)*

The sorption and chromatographic separation of gases using the XAD series of resins from Rohm and Haas is described. Even low molecular weight gases are moderately retained at lower temperatures. Hydrogen sulfide is more strongly retained, and sulfur dioxide and vinyl chloride are strongly sorbed. The chemical structure of the resin makes a significant difference in retention of the more polar gases such as H2S and SO2. These gases are more strongly sorbed on the acrylate resins and phosphonated resin than on the simble polystyrene resins. Ammonia has a much longer retention time on SAD-7 than on the polystyrene resins. A sample containing air, methane, carbon dioxide, ethylene, ethane, H2S, and SO2 was effectively separated on a short (2.5 ft) column containing SAD-4 resin. Temperature programming was employed. Organic liquids can also be separated by gas chromatography on XAD columns provided the liquids are fairly volatile. A separation of carbon 1 to C 7 alcohols is completely separated on an XAD-7 column using temperature programming. The alcohols are so strongly retained that a high column temperature is required for elution.

39397 **APTIC NO. 62355**

Fusamura, Nobuo, Tadaharu Nakamura, and Makoto Mori

PROPERTIES OF PARTICULATES COLLECTED BY CASCADE IMPACTOR. *(Kasukeido impakuta ni yoru hoshu biryushi no seijo). Text in Japanese. Preprint, Japan Mining and Metallurgical Inst. Tokyo, p. 163-164, 1974. 2 refs. (Presented at the Japan Mining and Metallurgical Institute Convention, Spring Meeting, Tokyo, Japan, March 26-28, 1974, Paper 2312.)*

Usina a six-stage cascade impactor, the suspended dust in air was collected to study its properties. Particle size of the dust collected on each stage was investigated and the general assumption that the apparent particle size is smaller for the dust collected at a lower stage was not substantiated. This may be due to various dust particles of different specific gravities contained in the suspended dust. Since a cascade impactor collects dust on basis of the inertial force principle, the separable particle size is smaller for a particular stage of the impactor if the dust particle is of greater specific gravity. Greasy substances were also recognized in the dust collected on all stages. Spherical particles are deposited on the first two stages and contain a number of extremely small particulates in each spherical particulate. Based on the average specific gravity of the atmospheric suspended dust of 2.3, as revealed by measurement of the sample collected by an electrostatic dust sampler, the 50% separation particle size for each stage of the cascade impactor was calculated as the mean particle size of the stage concerned. Those obtained at 21 measurements during 3 mo in winter were averaged, which showed a concave distribution pattern. The greasy particulates remain in their original forms even when dried for 24 hr. Heated at 350 C or higher by an electric furnace, they disappear, leaving only the micro-particulates they had contained behind. The greasy substances have a greater quantity of sulfur in addition to silicon and calcium found in the dust on the upper stages and the phosphorus, zinc, manganese, and potassium in the dust on the lower stages.

39398 **APTIC NO. 61757**

Gelbwachs, Jerry

LIMITATION TO OPTOACOUSTIC DETECTION OF ATMOSPHERIC GASES BY WATER VAPOR ABSORPTION. *Appl. Opt., 13(5):1005-1006, May 1974. 6 refs.*

The sensitivity of optoacoustic spectroscopy for the detection of light and heavy gases in the presence of strong and weak water vapor bands is calculated. Graphical representations of sensitivity as a function of minimum detectable absorption coefficient are used to conclude that water vapor limits equally the sensitivity at 1 atm pressure for detection of both light and heavy gases. The limiting values are 1000 ppb and 0.1 ppb in the proximity of strong and weak water vapor bands, respectively. These values are directly proportional to water vapor concentration. The limiting values for the detection of light molecules in the presence of water vapor can be reduced by a hundredfold at low pressure, whereas the anticipated improvement for the detection of heavy molecules is minimal. Caution should therefore be exercised in extrapolating from the sensitivity for monitoring light gases (pollutants) to the sensitivity for heavy gases (vapors of drugs and explosives).

39399 **APTIC NO. 62421**

Grant, W. B., R. D. Hake, Jr., E. M. Liston, R. C. Robbins, and E. K. Proctor, Jr.

CALIBRATED REMOTE MEASUREMENT OF NO2 USING DIFFERENTIAL-ABSORPTION BACKSCATTER TECHNIQUE. *Appl. Phys. Letters, 24(11):550-552, June 1974. 17 refs.*

A tunable dye laser, operating between 4400 and 4500 A was used to monitor nitrogen dioxide concentrations in a sample chamber 365 m away. The atmosphere in front of and behind the chamber acted as a distributed reflector to send laser light back through the chamber to a receiver near the laser. The laser measurements agreed well with in situ measurements. A single pair of laser pulses allowed the determination of NO2 concentration with an uncertainty equivalent to 0.05 km ppm. (Author abstract)

39400 **APTIC NO. 61859**

Gutsche, B. and R. Herrmann

FLAME SPECTROMETRIC F ANALYSES BY MEANS OF THE SRF-BANDS. *(Flammenspektrometrische F-Analysen mit Hilfe der SrF-Banden). Text in German. Fresenius Z. Anal. Chem., 269(4):260-267, 1974. 10 refs.*

By nebulizing strontium salts (nitrates, for example) and introducing the aerosol into a flame, strontium fluoride bands are observed if fluorine compounds are nebulized simultaneously. These SrF-bands are useful for F analysis. The best flame for this purpose is the turbulent hydrogen-oxygen flame in contrast to experience in F-sensitive flame detectors for gas chromatography. The most suitable SrF band is the band at 580 nm. The detection limit is 9.2 micrograms F. The precision is + or - 1.6%. The dynamic range is more than one power of ten. Interfering influences from sodium and phosphorus are discussed in detail along with possibilities for overcoming them.

39401 **APTIC NO. 61871**

Hasegawa Mitsuo, Hyogoro Aoyama, and Naoomi Yamaki

AS FOR THE SCRUBBER USED IN ANALYZING HYDROCARBONS BY THEIR TYPES. *(Tanka suiso taipubunseki no tame no sukuraba ni kansuru 2,3 no chiken). Text in Japanese. Bunseki Kagaku (Japan Analyst), (Tokyo), 23(1):28-39, Jan. 1974. 12 refs.*

The application of chemical absorbing agents (scrubbers) and a hydrogen flame ionization detector (FID) in evaluating the emission of hydrocarbons automotive exhaust gases is described. A scrubber is affected by its water content and the temperature. The Hg(ClO4)2 scrubber in its dry state removes olefins, acetylene, and aromatics at room temperature. At temperatures above 80 C it will also remove isoparaffins and cycloparaffins. When the scrubber is wet, it does not remove olefins or aromatics. The mercury sulfate-sulfuric acid scrubber is similarly affected. Systems have been assembled on a trial basis by combining scrubbers and FID for analysis of hydrocarbons in automotive exhaust gases. Successful analyses were made with scrubbers of diatomaceous earth coated with mercuric sulfate-sulfuric acid Hg(ClO4)2, and mercuric iodide-potassium hydroxide. Paraffins, olefins, acetylenes, and aromatics were measured. The results agreed well with those obtained by gas chromatographic analysis. This system is also applicable to the analysis of hydrocarbons in the atmosphere.

39402 **APTIC NO. 62181**

Hayashi, Miyoko

EXAMINATION OF METHODS OF SAMPLING ATMOSPHERIC STYRENE. *(Kichu suchiren no sampuringuho no kento). Text in Japanese. Preprint, Japan Society for Industrial Hygiene, Tokyo, p. 274-275, 1974. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 47th, Nagayo, Japan, March 29-31, 1974, Paper 336.)*

A solid adsorbent and a liquid adsorbent method for measuring styrene in environmental air were examined with respect to the variations in collecting efficiencies with different absorbing liquids, the effect of cooling on dust collection, the speed and timing of suction, and the change in recovery rate with the type of adsorbent and desorption time. In the liquid absorbent method, 90% ethyl alcohol, a small impinger, ice, suction rates of 1, 2, and 4 cf/hr, and suction times of 60 and 180 min were used. In the adsorbent method, carbon disulfide, and desorption times of 15, 30, 45, 60, and 120 min were used. Determination of styrene was done by gas chromatography. For a fixed sampling using the absorbent method, a suction rate of 2 cf/hr using 10 ml of ethyl alcohol and two small impingers gave the highest efficiency. For silica gel adsorption, 20 ml of carbon disulfide and 5 ml of water were the most efficient after 15-120 min.

39403 **APTIC NO. 62146**

Hermann, Joerg and Hans Joerg Eiberweiser

THE INFLUENCE OF THE GRAIN SIZE ON EXTINCTION MEASUREMENTS. EXPERIMENTS WITH THE OPTICAL SMOKE DENSITY MEASURING UNIT RM 4 BY THE COMPANY SICK. *(Korngroesseneinfluss bei Extinktionsmessungen. Versuche am optischen Rauchdichte-Messgeraet RM 4 der Firma Sick). Text in German. Staub, Reinhaltung Luft, 34(5):159-164, May 1974. 14 refs.*

By systematic variation of particle size using dusts from different sources (glass, limestone, fly ash, and coal) in a suitable testing stand the influence of particle size distribution on the measurements made by the RM4 Sick smoke density meter became evident. If the particle size and density are density are known, it is possible, using the diagrams given here, to find the relation between the measured extinction and the concentration of dust.

39404 **APTIC NO. 62812**

Herrebaut, L. and Guy J. Madelaine

THE USE OF CONDENSATION NUCLEI COUNTERS FOR THE DETECTION OF PARTICULATE AIR POLLUTANTS. *(Utilisation des compteurs de noyaux de condensation pour la detection de la pollution particulaire). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 29-1-29-5. 7 refs. (May 8-10.)*

The principle and the use of a condensation nuclei counter for the detection of particulate air pollutants are presented. The condensation nuclei counter measures the light attenuation caused by the condensation nuclei following adiabatic expansion of a water vapor-saturated air sample. The instrument operates practically continuously, supplying one measurement data every 4 seconds. The condensation nuclei counter is suitable for counting aerosol particles with a minimum size of 0.001 micron, and for aerosol concentrations from 50-1,000,000 nuclei/cu cm. Its sensitivity is 0.001 ppm for mercury, 0.1 ppm for hydrocarbons, and 0.001 ppm for sulfur dioxide; by photochemical conversion to 0.005 ppm for ammonia by acid-base conversion, to 0.5 ppm for nitrogen dioxide, and to 2 ppm for sulfuric acid. The condensation nuclei counter can be used for air pollution measurement, and for the control of absolute filters.

39405 **APTIC NO. 62814**

Heusden, S. van and D. J. Kroon

AUTOMATIC CHEMILUMINESCENT OZONE MONITORING. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 32-1-32-10. 5 refs. (May 8-10.)*

Some chemiluminescent methods for the automatic and continuous monitoring of ambient ozone are discussed, and their applicability in automatic monitoring systems are considered. Uses and setups of monitoring systems and networks are reviewed. The gas-gas reaction between O3 and ethylene is the best known chemiluminescent method. Another and more sensitive method is the reaction of O3 with rhodamine B organic dye. A chromatographic silica-gel sheet is dipped into an ethanolic solution of rhodamine B, dried, and installed in a reaction chamber in front of a photomultiplier. The radiation produced in the course of the reaction with O3 shows a maximum at 560 nm. The stability and lifetime of this system can be increased by adding an excess of gallic acid to the ethanolic rhodamine solution. Investigations are in progress into the possibilities of using other dyes such as safranin, fluorescein, and erythrosin. Frequent calibration is necessary for accurate measurement, and a calibration source consisting of a small mercury lamp in a thermostatically controlled aluminum housing was therefore added. The measurement of O3 using the chemiluminescence of a dye has a sensitivity which is at least two orders higher than the chemiluminescent reaction between O3 and ethylene. Thus, no temperature stabilization of the photomultiplier is required. In addition, the detection limit is lower (0.1 ppb). The agreement between the two methods using ethylene or rhodamine is very good.

39406 **APTIC NO. 62201**

Hinkley, E. D.

BISTATIC MONITORING OF GASEOUS POLLUTANTS WITH TUNABLE SEMICONDUCTOR LASERS. *Preprint, Massachusetts Inst. of Tech., Lexington, Lincoln Lab., 34p., 1974. 13 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 25th, Cleveland, Ohio, March 7, 1974, Paper MS-3671.)*

The development and application of bistatic monitoring for gaseous pollutants using tunable semiconductor lasers is described. The monitoring technique requires a remote reflector to return the laser beam which is directed toward a retroreflector which may be 1 km away. Very low and safe laser power levels can be used, 1 mW or less. Point sampling is performed by taking a sample from source effluent or from the ambient air and reducing the total gas pressure to a few torr, where the spectral linewidths are one or two orders of magnitude narrower than at atmospheric pressure. This technique has been used to detect nitric oxide, carbon monoxide, and ethylene in specimens of automobile exhaust, and sulfur dioxide in stack gas, with no interferences observed. As an example of the achievable sensitivity, over a 20-meter path, it is possible to detect concentrations of CO as low as 75 ppb. In situ monitoring can also be carried out, although greater attention must be paid to potential interferences. On-line measurements have been made of C2H4 in automobile exhaust and SO2 in a coal-burning power plant stack. Experiments on the bistatic monitoring of C2H4 across a parking lot and the measurement of CO and water in the ambient air are described.

39407 **APTIC NO. 62810**

Hollaender, W. and J. Schoermann

DETERMINATION OF THE MASS OF INDIVIDUAL AEROSOL PARTICLES BY OPTICAL INTERFEROMETRY. *(Massenbestimmung einzelner Aerosolteilchen durch optische Interferometrie). Text in German. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 26-1-26-10. 12 refs. (May 8-10.)*

Methodology and instrument for the determination of the mass of individual aerosol particles by optical interferometry is described. The aerosol particles in an aerosol jet accelerated to about 150 m/sec impact on a thin elastometic membrane in vacuum and generate small vibrations. Since the membrane constitutes one of the mirrors of a Mach-Zehnder interferometer, its vibrations are converted into oscillations of the interference pattern, and a photodiode is used as detector. The minimum pulse of the aerosol particles that can be measured is 0.000000000107 dyn/sec. Since the velocity of the particles is measured individually, a minimum mass of 0.0000000000000716 g can be measured. The interferometer is calibrated by means of latex balls each time after the membrane is replaced.

39408 **APTIC NO. 60170**

Honma, Katsunori

ON RECENT DEVELOPMENT IN INDOOR AIR POLLUTION MEASUREMENTS. *(Shitsunai kuki osen no sokuteiho ni okeru saiki no jokyo ni tsuite). Text in Japanese. Preprint, Japan Air Cleaning Assoc., Tokyo, p. 13-26, 1974. (Presented at the Technical Training Conference on Air Cleaning, 12th, Tokyo, Japan, March 27, 1974.)*

Suspended dusts are now subject to the regulatory controls set forth in the recently promulgated Environmental Standards Concerning Suspending Granular Substances and Law Concerning Securing of Sanitary Environment in Building. Considering the high-temperature and high-humidity environmental conditions in which various air pollutants are more likely to become granular, and taking into account the main components of air polluting substances, it is assumed that oxides of sulfur and nitrogen as well as various types of hydrocarbon formed by incomplete combustion of petroleum fuels play an important role in this area. Cigarette smoking and activity in a room cause dust and other air pollutants. For measurement of suspended dusts, the regulation specifies that suspended dusts with particle sizes of 10 micron or smaller should be gravimetrically measured. Fine dust particulates smaller than 10 micron are known as the respirable dust. The grading devices and filters used in gravimetric measurement are introduced, among which are the multistage grading device, the cyclone-type grading device, the inertial collision type grading device, and various filters including glass fiber types, cellulose-asbestos types, cellulose types, and membrane types. Their performance characteristics are discussed.

39409 **APTIC NO. 61932**

Honma, Katsunori

A METHOD OF MEASURING AEROSOLS USING PIEZO EFFECT. *(Piezo koka o riyo shita earozoru no juryo nodo sokuteiho). Text in Japanese. Preprint, Japan Assoc. of Industrial Health, Tokyo, p. 292-293, 1974. (Presented at the Japan Association of Industrial Health, General Meeting, 47th, Nagoya, Japan, March 29-31, 1974, Paper 402.)*

An electric dust collection method which collects aerosol particles on a rock crystal electrode is used for a test aerosol of lead fumes with large specific gravity and mixed particles of methylene blue and uramine. The quantities of the above-mentioned particles deposited on the rock trystal electrode were determined by atomic absorption spectrophotometry together with the measurement of thd mass sensibility to the change in frequency. As a result, the method of measuring the concentration by weight of aerosol using the piezo effect was very high in the mass sensibility, has a good response of 10 sec, and a good variation coefficient of 6% in regard to measuring accuracy. Problems of input air flow rate and collection efficiency, particularly the effect of particle size, must be examined.

39410 **APTIC NO. 61902**

Imamura, Kiyoshi, and Toru Fujii

STUDIES ON ATMOSPHERIC HYDROCARBONS (1): HC COMPONENT ANALYSIS. *(Taikichu no tanka suiso ni kansuru kenkyu (1): Tanka suiso seibun bunsekiho no kento). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 900, 1974. (Presented at the Japan Chemical Society Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 900.)*

Gas chromatography-mass spectrometry was used to analyze mixtures of hydrocarbons. Five liters of sample gas were collected into two U-shaped tubes cooled with liquid oxygen, after passing through a tube packed with soda lime and potassium carbonate. The volume of each U tube was 6 ml and each was packed with 1 g of C22. The U tubes were then heated at 140 C while the carrier gas was passed through. Sample gas from the first U tube was introduced to column A, which was packed with 3% Squalene on alumina, and that from the second U tube to column B, which was packed with 25% Apiezon on chromosorb W. Column A was for lower hydrocarbons (C1 to C4) and column B was for higher hydrocarbons. A flame ionization detector was used for both columns. Satisfactory separation and identification of a mixture containing ethylene, propylene, acetylene, benzene, toluene, ethylbenzene, p- and m-xylene, and o-xylene was possible.

39411 **APTIC NO. 62488**

Iwamatsu, Yoshio and Tatsuo Kato

SELECTIVE ANALYSIS OF ALDEHYDES IN THE AIR BY A SOLID REACTION TUBE COLLECTION - GAS CHROMATOGRAPHIC METHOD. *(Kankyu arudehidorui no kotei hannokan hosoku-GCho ni yoru sentaku bunseki). Text in Japanese. Preprint, Japan Inst. for Architecture, p. 19-20, 1974. (Presented at the Japan Institute for Safety Engineering Symposium of Safety Engineering, 5th, Tokyo, Japan, June 20-21, 1974, Paper 10.)*

A method of analyzing trace amounts of aldehydes using 2,4-dinitro phenyl hydrazine and gas chromatography was developed and the range of application examined. About 5-10 g of clean 15-28 mesh glass beads are mixed with 1 wt% of 2,4 DNP and 2 wt% of phosphoric acid. The mixture is packed into a glass column with a glass filter. The preparation should be made in a clean room and the column should be tightly stopped by silicon rubber stoppers until it is ready for use. Test air is drawn into the tube by a suction pump. The beads are removed to an analysis tube, and nitrogen gas heated to 100 C is passed through to remove water and other volatile elements. Phthalic acid twice the weight of the beads is crushed and added. Nitrogen gas is passed through tube and the tube is heated to 220 C for 30 min. The gas from the tube is sent to the GC column cooled with liquid oxygen, and aldehydes are adsorbed. Aldehydes are analyzed by flame ionization detector. The method was applied to analyses of automotive exhaust gases, air from a factory environment, and cigarette smoke. In all cases the method was satisfactory.

39412 **APTIC NO. 61881**

Iwasaki, Yoshiteru, Tatsukichi Ishiguro, Hiroshi Fukushima, Haruyoshi Onozuka, and Toshio Ohira

EXAMINATION OF METHODS AND RESULTS OF POLLUTANT MEASUREMENTS FOR SANITATION PLANT EXHAUST GASES. *(Seiso kojo ni okeru haigasu osenshitsu no sokuteiho no kento to kekka ni tsuite). Text in Japanese. Tokyo-to-Kogai Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Inst. Environ. Prot.), vol. 5:37-43, March 1974.*

The Chitose sanitation plant in Tokyo was completed in March 1971. Hydrogen chloride, sulfur dioxide, nitrogen oxides, hydrocarbons, and dusts have been measured since Sept. 1971. The emission concentration of HCl is 650-850 ppm, SO2 35-45 ppm, NOx 130-158 ppm, and dusts 23-29 mg/N cu m. The measurement methods are: the silver nitrate method and electroconductivity for HCl; arsenazo III and infrared absorption spectrophotometry for SO2; a modified Saltzman method (absorbent composition and oxidation methods improved), a quick PDS method, infrared absorption, and chemiluminescence for NOx; and a quartz filter dust tube for dusts. Hydrogen cyanide was measured by pyridine pyrazolone, and total HC was measured by a continuous meter with a flame ionization detector. The HCl measurements showed considerable fluctuations, probably due to the variations of combustion conditions and qualities of waste material. The HCl is easily absorbed in water, and when there was drain in the sampling system, HCl was absorbed and the measurement was lower than the actual figure. Since SO2 and NOx concentrations at a sanitation plant are relatively low, the electroconductivity method is applicable. When using infrared absorption for SO2, an adjustment with carbon dioxide is necessary. There were some drastic increases in dusts, hydrocarbons, and SO2 concentrations. These fluctuations must be studied in the light of combustion conditions.

39413 **APTIC NO. 62450**

Janssens, M. and R. Dam

DETERMINATION OF CADMIUM IN AIR PARTICULATES BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY WITH A GRAPHITE TUBE. *Anal. Chim. Acta, 70(1):25-33, May 1974. 13 refs.*

A sensitive and selective determination of cadmium in aerosols by flameless atomic absorption spectrometry is described. By two successive treatments in 0.1 M suprapure nitric acid, the cadmium is removed from the paper filter on which the particulates have been collected. Routinely, 10-15 microliters of the 100-ml solution are injected into a graphite oven and the percentage absorption at 228.8 nm is measured. If half a 24-hr filter (400 cu m air) is used, the dilution is made to 50 ml, and 50 microliters is injected, an unusually low concentration of 0.20 ng/cu m can be determined quantitatively with a relative standard deviation of 10%. The reproducibility of the complete procedure is 4.8%. An interlaboratory comparison indicated that the accuracy is very good. The same solution can also be used for lead determination mostly without any further dilution. As an application, the cadmium concentrations were measured on two different days at 14 stations of the nationwide sampling network, and the influence of nonferrous industries on the cadmium levels is shown.

39414 **APTIC NO. 62595**

Johnson, Jack L.

CHARACTERIZATION OF AIR-BORNE PARTICULATES. *Microchem. J., 19(2):168-178, June 1974. 26 refs. (Presented at the International Symposium on Microchemical Techniques, University Park, Pa., Aug. 19-24, 1973.)*

Reliable instrument and chemical analysis techniques are being applied to the rapid and accurate characterization of airborne particulates including microanalysis, structure identification, and quantitative elemental analysis. Microanalytical techniques include optical microscopy, scanning electron microscopy, and electron probe microanalysis. X-ray diffraction provides valuable information on the structure of crystalline materials which can lead to compound identification. This identification is accomplished by comparing the diffraction patterns with powder diffraction data. Methods for quantitative analysis of particles include X-ray fluorescence, atomic absorption spectrophotometry, and ultraviolet-visible-infrared spectrophotometry. The choice of the method is governed by the amount and type of sample and by the elements of interest. Most of the problems associated with the analyses can be overcome with proper sampling, sample handling, and the development of suitable standards. Future improvements will be undoubtedly directed towards increased analytical sensitivity because the sample size will become smaller as the concentrations of pollutants decrease with improved emissions control. (Author summary modified)

39415 **APTIC NO. 62860**

Katagiri, Yoshinori, Katsuhisa Fukaya, Syozo Fukui, and Saburo Kanno

HYGIENIC CHEMICAL STUDIES ON ENVIRONMENTAL POLLUTION BY HARMFUL SUBSTANCES. VII. A SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF PYRIDINE IN STACK GASES. *(Yugai busshitsu ni yoru kankyo osen no eisei kagakuteki kenkyu (dai7-ho) haigasuchu no pirijin no hishoku teiryoho). Text in Japanese. Eisei Kagaku (J. Hyg. Chem), 20(2):102-196, April 1974. 6 refs.*

A spectrophotometric method for the determination of pyridine in stack gases was determined. The gas containing pyridine was absorbed in 0.1 N sulfuric acid and reacted with pyrazolone and cyanogen chloride to form a blue complex. The absorbance was measured at near 620 nm. The calibration curve followed Beer s law. Ammonia and nitrogen dioxide did not interfere but sulfur dioxide affected the determination. The

SO_2 was removed by a potassium hydroxide trap without loss of pyridine. The color was stable for at least 60 min and the procedure is comparatively simple.

39416 **APTIC NO. 62815**

Kelley, J. J.

ON THE ROLE OF CALIBRATION INTEGRITY IN ATMOSPHERIC TRACE GAS MONITORING. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, Paris, France, 1974, p. 33-1-33-13. 23 refs. (May 8-10.)*

Many monitors are available for analyzing trace gases such as sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, and oxidants in ambient air, at stationary sources, and from vehicles. The accuracy and validity of the data derived from air monitoring instrumentation depend greatly on the extent of quality control procedures employed. Instrument calibration is most important to the comparison and utilization of the data that are produced. Most analytical equipment are subject to drift, internal variations, and in some cases doubt concerning the stoichiometry of the reactions involved. Therefore it is necessary to check and validate all test methods. Carbon dioxide has important effects on the earth s heat balance. Climatic temperature changes can be caused by variations in the amount of CO_2 in the atmosphere. Until 1957, CO_2 measurements were not accurate or sensitive enough to provide needed data on CO_2 trends. Beginning in 1957, measurements were made by nondispersive infrared analysis using a series of accurately controlled reference gases. Major emphasis was on accurate standardization and systematic intercalibration of the reference gases. All of the data showed an average annual increase of CO_2 of about 0.8 ppm by volume dry air. Ozone concentrations in the stratosphere have increased according to analysis of data during a ten-year period at selected world stations. A similar upward trend in surface ozone was also observed. A neutral buffered potassium iodide colorimetric method is commonly used to standardize coulometric analyzers. However several degrees of complexity may cause doubt in comparison of data. Since nondispersive infrared gas analysis is the accepted method for observing CO_2, it lends well to direct calibration. However its + or - accuracy must be improved for analyses in nonpolluted air. Methods for measuring sulfur dioxide and nitrogen dioxide have also undergone validation tests.

39417 **APTIC NO. 62531**

Kishi, Hideko, Tsunehiko Otoshi, Kikuo Oikawa, and Yoshikazu Hashimoto

PREPARATION OF ATMOSPHERIC METAL COMPONENTS ANALYSIS TEST MATERIAL (1): EXAMINATION OF FLUCTUATIONS. *(Taikichu kinzoku bunsekiyo kyotsu shiryo no shisaku (1): shiryo no baratsuki no kento ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 679, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, April 1-4, 1974, Paper 1G24.)*

For the purpose of comparing radioactive analysis measurements of metal components in suspended particulates, attempts were made to prepare a consistent material applicable for repeated tests, and measurement fluctuations were examined. To get a large quantity of sample in a short time, a filter was set at the air entrance of a building air conditioner, and dusts accumulated over a long period (about 6 kg) were collected and used as test material. The dusts were dried at 105 C (plus minus 5 C), sifted by a 200 mesh sift, mixed for 10 hours in a ball mill, and again sifted through 200 mesh. Several hundred mg were taken out from this and mixed thoroughly. Analyses were given repeatedly, and the fluctuation was checked to see the analysis error. In this case, the test material was considered completely mixed; therefore, if this hypothesis is not acceptable, another method of obtaining consistency must be devised. A mathematical analysis of the analysis error is presented.

39418 **APTIC NO. 62541**

Krejci, M. and K. Tesarik

APPLICATION OF CHROMATOGRAPHY TO THE ANALYSIS OF EXHAUST GASES. *J. Chromatog., vol. 91:525-530, April 1974. 9 refs.*

The chromatograph used for determination of basic components in exhaust gases is described. An analysis for carbon monoxide, carbon dioxide, hydrogen, oxygen, and total hydrocarbons takes 3 min. The error of the method was determined for individual components. The properties of the flame ionization detector when nitrogen and air are used for the introduction of the sample into the flame are compared. In order to evaluate the change in the composition of the hydrocarbons in exhaust gases depending on the functioning of the engine, the enrichment technique was used for sampling. The method for sampling is described, and the results obtained with different functioning of the engine of an S 110 automobile are shown. (Author summary modified)

39419 **APTIC NO. 62439**

Kuykendall, W. E., Jr., L. E. Fite, and R. E. Wainerdi

INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF AIR FILTER SAMPLES. *J. Radioanal. Chem., 19(2):351-358, 1974. 7 refs.*

The capabilities of automated instrumental neutron activation analysis (INAA) to measure trace elements in airborne particulates was demonstrated on 40 air filter samplers from the metropolitan area of Cleveland, Ohio from Aug.-Nov. 1971. A large number of elements (over 33) were detectable at various detection limits. These values are given in a table. Aluminum, bromium, manganese, sodium, chlorine, antimony, chromium, scandium, and zinc were present at concentrations well above their detection limits. A number of environmentally important elements were very near or even blow their detection limits, such as cadmium, silver, and nickel. Of the Cleveland samples, 80% lie within 0.25 to 5.0 times concentrations reported for East Chicago, Indiana, and Niles, Michigan. The median detection limit for airborne concentration of an element was approximately 4 times 10 to the -9th power g/cu m. Around 26 elements were detectable in a typical cellulose filter sample. The method was nondestructive, therefore the sample could be retained for further analysis. The INAA did have poor sensitivity for metals such as lead, Ni, and Cd. The delay time between receipt of sample and availability of results was 4-6 wk for 13 of the elements. The INAA was very competitive from the standpoint of sensitivity and cost.

39420 **APTIC NO. 62545**

Lambert, Jack L. and Robert E. Wiens

INDUCED COLORIMETRIC METHOD FOR CARBON MONOXIDE. *Anal. Chem., 46(7):929-930, June 1974. 5 refs.*

An induced colorimetric method for determining carbon monoxide in air is described. A reagent consisting of tetrachloropalladate (II), iodate, and reagent A leuco crystal violet (4,4 prime, 4 double prime-methylidynetris (N,N-dimethylaniline) produces crystal violet in proportion to the concentration of CO and the time of reaction. Measurements were also made for CO with various concentrations of nitrogen dioxide, hydrogen sulfide, and sulfur dioxide. None of these gases interfered significantly with the response of reagent solution A to CO concentrations of O, 43 and 63 ppm if the concentration of interfering gas was less than 4 ppm. When the SO_2 concentration was 21 ppm, the response of 42 ppm CO was approximately 10%.

39421 **APTIC NO. 62818**

Leaseburge, E., L. F. Millett, and D. N. Campbell

ADVANCES IN CHROMATOGRAPHY FOR ENVIRONMENTAL MEASUREMENTS. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 37-1-37-11. 6 refs. (May 8-10.)*

Gas chromatographs for use in the refining and petrochemical industries are reviewed. Basic chromatography, flame photometric detectors, and flame ionization detectors are discussed. The Bendix Series 8700 Sulfur Chromatographs have a flame photometric detector and can be used to detect sulfur compounds such as hydrogen sulfide and sulfur dioxide. The differences between this detector and normal flame photometric detectors are analyzed mathematically. The Bendix Model 8200 Analyzer uses a flame ionization detector to measure total hydrocarbons, methane, and carbon monoxide. Full sensitivity of 1 ppm can be attained for CH_4 and CO with sensitivities of 200 ppb or less for total HC. The operation of these analyzers are described.

39422 **APTIC NO. 62549**

Lee, Robert E., Jr. and Jack Hein

METHOD FOR THE DETERMINATION OF CARBON, HYDROGEN, AND NITROGEN IN SIZE FRACTIONATED ATMOSPHERIC PARTICULATE MATTER. *Anal. Chem., 46(7):931-933, June 1974. 9 refs.*

A technique for characterizing carbon, hydrogen, and nitrogen constituents in atmospheric particulate matter as a function of particle size is described. The technique was applied to a limited number of cascade impactor samples collected in Ankara, Turkey, London, and Chicago. Ankara exhibited the highest concentrations of total suspended particulates (TSP), C, and H_2. No clear pattern was associated with the concentration of N_2. In all areas the mass median diameter of C and H_2 associated particles was generally larger than for TSP matter. The N_2- containing particles generally exhibited mass median diameter values lower than for TSP and may have a predominantly biological origin. Fuel combustion appears to be a substantial factor in the percentage of C in airborne particles with the highest levels observed in Ankara where lignite coal is the predominant fuel. An estimate of the degree of saturation of hydrocarbon compounds in suspended particles as a function of size can be made by calculating the C:H molar ratio although the contribution of carbonates is not taken into account.

39423 **APTIC NO. 62594**

Leonardos, Gregory

A CRITICAL REVIEW OF REGULATIONS FOR THE CONTROL OF ODORS. *J. Air Pollution Control Assoc., 25(4):456-468, May 1974. 29 refs.*

State and local odor control regulations are critically reviewed and suggestions for improvement are offered. The main difficulty with odor measurement techniques upon which the regulations are based is they measure only one aspect, threshold, of the four dimensions that are of critical importance from the standpoint of air quality. Odor measurement should include an assessment of the intensity and the quality of the odorous sensation. These dimensions can be measured effectively by calibration of the instrument, the human and his nose, and by the use of appropriate reference standards both for intensity and quality. With more information of these three dimensions, the acceptability of an odor can be inferred from a consideration of all three dimensions, detectability, intensity, and quality, and from none taken alone. The existing odor regulations are quite varied and are satisfactory to few. They have failed to provide the appropriate information and the need for establishing a better basis upon which effective odor control regulations may be developed is recommended. Since individual state and local agencies do not have the necessary financial resources to investigate the various aspects of the problem of odorous pollution measurement, a cooperative effort between industry and the various governments levels is recommended. (Author summary modified)

39424 **APTIC NO. 62291**

Lievens, F.

THE CHEMICAL ANALYSIS OF AIR POLLUTANTS. *Center d Etude de L energie Nucleaire, Brussels (Belgium), 25p., 1974 (?). 29 refs.*

NTIS: BLG 480

Methods for the chemical analysis of gaseous and aerosol air pollutants are described. Aerosol sampling is based on particle collection by filtration, impaction, or electrostatic precipitation. The retained method will depend on the purpose of the measurement, on the elements to be determined, and on the measuring techniques used. The elemental analysis of airborne dust is described using emission spectrometry, neutron activation analysis, X-ray fluorescence analysis, and atomic absorption spectrophotometry. Gaseous pollutants occur in the atmosphere in low concentrations, usually in the range of ppb or a few ppm by volume. To reach these low levels the measuring technique needs a high sensitivity, backed up in most instruments by a preconcentration step. Specific instruments include colorimetric analyzers, conductimetric analyzers, coulometric analyzers, flame photometric analyzers, and nondispersive infrared analyzers. Methods for measuring sulfur dioxide, nitrogen dioxide, nitric oxide, carbon monoxide, hydrocarbons, and organic acids are described.

39425 **APTIC NO. 62590**

Lucero, Daniel P. and Joseph W. Paljug

MONITORING SULFUR COMPOUNDS BY PHOTOMETRY. *Tribune de CEBEDEAU (Centre Belge Etude Doc. Eaux), 27(364):139-147, May 1974. 14 refs. (Presented at the EPA/ASTM/NCAR Committee D-22 Meeting at the Conference on Instrumental Monitoring for Ambient Air, Boulder, Colo., August 14-16, 1973.)*

The analysis for sulfur by a flame photometric detector (FPD) is discussed. The operation of a FPD is based on the chemiluminescence of an activated molecular S species produced by a hydrogen hyperventilated diffusion flame. A predictable detector response is obtained from a gas molecule in proportion to the number of S atoms it contains. An FPD S analyzer is comprised of an FPD and photomultiplier tube assembly, a pneumatic sampling and flow control network, and a signal conditioning and electronic subsystem. The analyzer output can assume three basic forms which provide sensitivity for ppb level analysis, broad dynamic range, or convenient readability. The FDP analyzers were used extensively for laboratory analysis and ambient and area monitoring. By a continuous sample conditioning procedure, the analyzer can be used for source monitoring and on stream process analysis. Sulfur compounds are detected by a wide variety of techniques including the following detectors: flame photometric, gas chromatographic/polarographic, conductimetric, coulometric, polarographic, colorimetric, and spectrophotometric. Analyzers incorporating FPD are specific to S molecules while the remainder respond in significant and varying degrees to nitrogen dioxide, ozone, ammonia, and other molecules. (Author abstract modified)

39426 **APTIC NO. 62881**

Ludwig, C. B., M. Griggs, W. Malkmus, and E. R. Bartle

MEASUREMENT OF AIR POLLUTANTS FROM SATELLITES. 1: FEASIBILITY CONSIDERATIONS. *Appl. Opt., 13(6):1494-1509, June 1974. 55 refs.*

The feasibility of observing air pollutants from satellite-borne sensors is investigated. Radiative transfer calculations, using both line-by-line and band-model methods, are made to establish the signal changes that originate from the presence of various amounts of pollutants in the atmosphere. The effect of interfering species is considered. The signal change is the radiance difference on top of the atmosphere between clean and polluted atmospheres. The calculations of signal change are performed for several gaseous and particulate pollutants on a global scale. Trace contaminants can be observed through a nadir experiment in which the sensor is earth-oriented or through a limb experiment in which the sensor is horizon oriented. Sources, sinks, and distribution of pollutants, atmospheric scattering, infrared bands of pollutants and interfering gases, ground emissivity, minimum detectable pollutant concentrations in the stratosphere, and passive observations of aerosols from satellites are discussed. (Author abstract modified)

39427 **APTIC NO. 62414**

Lutz, G. J.

THE ANALYSIS OF BIOLOGICAL AND ENVIRONMENTAL SAMPLES FOR LEAD BY PHOTON ACTIVATION. *J. Radioanal. Chem., 19(2):239-244, 1974. 5 refs.*

Since lead in biological and pollution samples is not determined well with thermal neutron activation analysis, analysis by photon activation was studied. Irradiations were conducted in the 45-degree facility at the National Bureau of Standards electron linear accelerator. After irradiation, the samples were transferred to a clean polyethylene vial, and the lead activity was counted with a germanium(lithium) detector or the samples were dissolved and the lead separated. The irradiation and post-irradiation procedures are described, and sources of systematic error, counting errors, and other discrepancies are discussed. Photon activation analysis of lead in orchard leaves, soil, beef liver, and kale gave favorable precision and accuracy compared with other methods. In general, a few ppm of lead can be determined nondestructively and on the order of tens of nanograms with rigorous chemical separation. This method can also be used to measure lead in the air.

39428 **APTIC NO. 62152**

Maddalone, Ray F., A. D. Shendrikar, and Philip W. West

RADIOCHEMICAL EVALUATION OF THE SEPARATION OF H2SO4 AEROSOL BY MICRODIFFUSION FROM VARIOUS FILTER MEDIA. *Mikrochim. Acta, no. 3: 391-402, 1974. 9 refs.*

Dubois et al have based a sulfuric acid determination on the separation of H2SO4 from glass fiber filters by microdiffusion. No absolute values, however, for H2SO recovery were mentioned nor were other filter media tried. In order to verify and expand their results, a radio-tracer study of microdiffusion using S35 labeled H2SO4 was initiated. A series of filter media were tested for their utility as surfaces to diffuse H2SO4. Those filter media studied were: soft glass plate, Gelman A glass filter paper, 5.0 micron Mitex (teflon), 0.5 micron Solvinert, 1.0 micron Nucleopore, Whatman 41, and Poco graphite filter. Time from 1 to 6 hours and temperature from 100 C to 195 C were investigated. The Mitex and the Poco graphite had the best diffusion characteristics, but both exhibited the same lower limits The microdiffusion apparatus should be modified to a system in which the absorbing substance covers the entire inside surface except that area covered by the filters. The inner diameter of the cover dish should exactly (within 1 mm) match the diameter of the filter media. Glass fiber filters should not be used as a H2SO4 sampling media. Suitable filters for collecting H2SO4 aerosol can be made of pure teflon and graphite. (Author abstract modified)

39429 **APTIC NO. 62806**

Maigne, J. P., P.-Y. Turpin, G. Madelaine, and J. Bricard

NEW METHOD FOR THE DETERMINATION OF THE GRANULOMETRIC DISTRIBUTION OF AEROSOL PARTICLES BY MEANS OF DIFFUSION CELL. *(Nouvelle methode de determination de la granulometrie d un aerosol au moyen d une batterie de diffusion). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 21-1-21-9. 5 refs. (May 8-10.)*

A mathematical method for the evaluation of experimental data obtained by diffusion cell for the determination of the granulometric distribution of aerosols is presented. Uranium aerosol was used for the experiments, and the results were compared to electron microscopic examinations. The algorithm of the determination of the granulometric spectra is presented. The mathematical method is especially suited for the determination of the granulometric distribution of aerosols formed by radiolysis and photolysis in the atmosphere.

39430 **APTIC NO. 62444**

Menzies, R. T. and M. S. Shumate

AIR POLLUTION: REMOTE DETECTION OF SEVERAL POLLUTANT GASES WITH A LASER HETERODYNE RADIOMETER. *Science, 184(4136):570-572, May 3, 1974. 7 refs.*

An infrared heterodyne radiometer with a spectral resolution of 0.04 reciprocal centimeters has been used to remotely detect samples of ozone, sulfur dioxide, ammonia, and ethylene at room temperature, and samples of nitric oxide at 390 K. Each gas was observed in a background of nitrogen or oxygen at atmospheric pressure. Sensitivities to some of these gases are adequate for detection of ambient concentrations as low as a few parts per billion. The heterodyne radiometer is useful for remote observation and measurement of atmospheric constituents whenever high spectral resolution is desired. The spectral resolution makes the instrument very selective, as interference problems due to overlapping lines or bands are minimized. Possible applications include monitoring of local air pollution from the ground or of global atmospheric quality from spacecraft. The heart of the instrument consists of an infrared laser as a local oscillator, and a high-speed infrared detector. The local oscillator beam and the radiation to be detected are normally combined via a beam splitter and are then focused onto the detector, which acts as a mixer. (Author abstract modified)

39431 **APTIC NO. 62855**

Miller, K., J. H. Kozak, and H. W. De Koning

ORIENTATION EFFECT OF GLASS FIBER FILTERS ON TOTAL SUSPENDED PARTICULATE MEASUREMENTS. *Atmos. Environ., 8(5):519-520, May 1974. 2 refs.*

A comparative study, using three hi-vol samplers, was run in Windsor, Ontario to determine the effect of glass fiber filter orientation (rough side up or down) on total suspended particulate measurements. Normally the filters are run rough side up. Three samplers were positioned within the fenced-in area at the air pollution monitoring station located at the intersection of Mill and Peter Streets, Windsor. The samplers were run on a 24-hour period starting at midnight. The first sampler was run with the filter installed in a normal positon, the other two were equipped with filters in the upside down position. The samplers were calibrated using a calibrating orifice assembly. The glass fiber filters were weighed after conditioning in a humidity-controlled atmosphere for 24 hr. before and after sampling. The study revealed that the orientation of the glass fiber filters does not affect the measurement of total suspended particulate matter under conditions normally employed using the hi-vol sampler.

39432 **APTIC NO. 61857**

Neeb Rolf and Faramarz Wahdat

DETERMINATION OF CADMIUM IN AEROSOLE SAMPLES BY STRIPPING VOLTAMETRY. *(Zur invers-voltametrischen Bestimmung des Cadmiums in Aerosolen). Text in German. Fresenius Z. Anal. Chem., 269(4):275-279, 1974. 11 refs.*

For the inverse-voltammetric determination of small contents of cadmium in aerosol samples, the volatilization of cadmium in a stream of hydrogen at elevated temperatures followed by oxidation of the sample in a stream of oxygen is proposed. From 0.15 to 0.25 micrograms of cadmium can be determined with certainty in a 125 sq cm filter sample. The method was used for determination of the cadmium concentration in aerosol samples taken in Gelsenkirchen, a dense industrial area, in the Black Forest, and in the city of Mainz. Cadmium was found in all samples. In Mainz, the concentration corresponded to the average concentration of 1.5 ng/cu m measured in the Federal Republic of Germany.

39433 **APTIC NO. 62386**

Oblaender, Werner and Wolfram Morgenstern

AUTOMATIC MULTI-COMPONENT MEASUREMENT GRID FOR BADEN-WUERTTEMBERG. *(Automatisches Vielkomponenten-Immissionsmessnetz fuer Baden-Wuerttemberg). Text in German. Chemiker-Ztg. (Heidelberg), 98(5):248-253, 1974. 5 refs.*

The emission measurement grid of Baden Wuerttemberg is described. The grid will have a total of 14 stations; four stations will be located in Mannheim, four in Karlsruhe, three in Stuttgart, and one each in Ulm, Heilbronn, and Freiburg. In Mannheim three stations will soon go into operation. The other stations will start operation within the next 2 years so that by 1976 the entire grid will operate. Carbon monoxide and carbon dioxide will be measured by infrared photometry (a single beam infrared photometer with radiation modulation), hydrocarbons with a flame ionization detector, dust by a photometric method, ozone by chemiluminescence, oxides of nitrogen by chemiluminescence, and sulfur dioxide is determined by a flame photometric analyzer with hydrogen flame. The data are transmitted by postal telephone lines to the central computer.

39434 **APTIC NO. 61876**

Ohira, Toshio

AN OBSERVATION ON AIR POLLUTION MONITORING NETWORKS. *(Taiki osen sokuteimo ni tsuite no kosatsu). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Inst. Environ. Prot.), vol. 5:1-10, March 1974.*

A general discussion is given on the idea of air pollution, functions of monitoring networks and necessary conditions to satisfy those functions, important factors for monitoring station installation, and errors of instrumental analyses. Constant monitoring of air pollution by automatic instruments began in 1962 in Tokyo. Since then, sulfur dioxide and airborne particulates have been measured constantly by the conductivity method and tape air sampler method, respectively. Constant monitoring of air pollution is very important since it provides information for making better environmental standards and plans for preventing pollution damages, and understanding the pollution trend which is important to city planning and land developing. In 1968, the total emission of SO2, carbon monoxide, hydrocarbons, nitric oxide and dust in the U. S. was 214 million tons while that in Japan was 12 million tons. Environmental Protection Agency guidelines show that the number of pollution monitoring stations is determined by the populations and the degree of pollution of a given area.

39435 **APTIC NO. 62460**

Otsuka, Toshio

PREPARATION OF SMALL AMOUNT STANDARD GAS BY PERMEATION TUBE. *(Pamieshon chubu ni yoru biryo hyojun gasu no choseiho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 680. 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, April 1-4, 1974, Paper 1G25.)*

For preparation of small amounts of standard gases, a trial gas producer was constructed using a permeation tube, and the results were examined. Highly pure sulfur dioxide, nitrogen dioxide, hydrogen sulfide, chlorine, and ammonia were liquefied respectively in fluoride resin tubes, and both ends were closed by F resin. Permeation speeds (Pr) were measured by the weight method. The standard gas preparation calculation formula is given. Standard gases prepared by permeation tube were chemically analyzed. For SO2, the pararosaniline method, for NO2, the Saltzman method, for H2, the methylene blue method, for NH3, the indophenol method, and for Cl2, the Orthotridine method were used. The results agreed very well.

39436 **APTIC NO. 61856**

Rath, Robert and Dieter Pohl

PARTICLE SIZE DETERMINATION WITH THE PARTICLE COUNTER. *(Teilchengroessenbestimmung mit dem Partikel-Zaehler). Text in German. Staub, Reinhaltung Luft, 34(4):130-134, April 1974. 11 refs.*

A brief explanation of the theory of particle counting and size determination using light scattered by flowing dust-like particles is given along with a mathematical analysis. The theory is realized in the particle counter.

39437 **APTIC NO. 62678**

Rehme, K. A., B. E. Martin, and J. A. Hodgeson

TENTATIVE METHOD FOR THE CALIBRATION OF NITRIC OXIDE, NITROGEN DIOXIDE, AND OXONE ANALYZERS BY GAS PHASE TITRATION. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Program Element 1A1010, Rept. EPA-R2-73-246, 21p., March 1974. 7 refs.*

NTIS: PB 231571

A technique is described for the dynamic calibration of ambient air monitors for ozone, nitric oxide, and nitrogen dioxide. A gas phase titration procedure utilizing a rapid gas phase reaction between NO and O3 is used such that when the concentration of one of the three gases is kaown, the concentrations of the other two are determined. Initially a cylinder of NO in nitrogen is standardized by gas phase titration with O3 in concentrations that have been determined iodometrically. Cylinder NO is then used as a secondary standard for routine calibrations. Ozone is added to excess NO in the dynamic calibration system, and a chemiluminescent NO monitor is used as an indicator of changes in concentration. The decrease observed on the spanned NO monitor upon addition of O3 is equivalent to the concentration of NO consumed, the concentration of O3 added, and the NO2 concentration produced. The advantages of the procedure are that a primary standard for only one of the gases is required and that rapid and routine calibrations of monitors for the three gases may be performed at a common manifold. (Author abstract modified)

39438 **APTIC NO. 62811**

Riediger, G.

THE USE OF ANDERSEN S CASCADE IMPACTOR FOR INDUSTRIAL HYGIENIC TESTING, AND ESPECIALLY FOR THE DETERMINATION OF THE FRACTIONAL SEPARATION EFFICIENCY. *(Ueber den Einsatz des Andersen- Kaskadenimpaktors in der gewerbehygienischen Prueftechnik, speziell zur Bestimmung des Fraktionsabscheidegrades). Text in German. Inst. Nationale de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 28-1. (May 8-10.)*

The uses and advantages of Andersen s eight-stage cascade impactor with multiple nozzles in each stage in industrial hygiene and in the determination of the fractional aerosol separation efficiency of industrial and other separators are described. The gravimetric measurement and evaluation of aerosol samples collected in the individual stages is facilitated by multiple nozzles which permit the collection of large samples for industrial hygienic investigations. The collection time required for aerosol sampling after the separators can be reduced by switching from gravimetric to microscopic evaluation on the basis of certain relationships between the gravimetric and microscopic measurement data.

39439 **APTIC NO. 62536**

Romano, A. J., D. W. Huszagh, J. Klein, R. Doering, and L. Newman

THE USE OF A SELF-CLEANING, LOW-COST DILUTION SYSTEM IN THE CONDITIONING OF FLUE GASES FOR UNATTENDED SO2 OR NOX MONITORING. *Combustion, 45(11):36-39, May 1974. 7 refs.*

The feasibility of semi-continuous monitoring of flue gas sulfur dioxide using a standard detector by conditioning the sample using a self-cleaning, inexpensive precision diluter was demonstrated. The diluter-sampler was evaluated in the laboratory. Trouble-free operation of the diluter-sampler in a power plant duct was achieved for about 1 mo. By using operating parameters such that a dilution of about 10:1 was achieved, the system produced a gas mixture with a dew point of approximately 60 F, which would be compatible with most commercial monitors used at normal ambient temperatures. Higher dilutions could be produced by cascading two or more systems of the type evaluated or by using a smaller orifice. This would afford even lower operating dew points and would also reduce the maximum range required of the monitoring instrument. Conversely, the precision of the overall measurement would decrease. The venturi exhauster could be located in the duct. The present design requires heating of the flue gas sample line to avoid condensation of water. By placing the entire probe assembly and venturi into the duct, the need for auxiliary heating would be avoided. The diluter-sampler consists of a high-volume, low pressure, compressed air supply; a probe assembly for drawing samples from a stack, flue, or plenum; a sample mixing and conditioning system; and an optional calibration system and sensor. (Author conclusions modified)

39440 **APTIC NO. 61756**

Rosengren, Lars-Goran, Erland Max, and Sverre T. Eng

A STUDY OF LASER-ACOUSTIC AIR POLLUTION MONITORS. *J. Phys. E., 7(2):125-133, Feb. 1974. 18 refs.*

The use of lasers in combination with an opto-acoustic detector is examined for the detection of gaseous air pollutants; and a test system is described by which polluted air can be produced synthetically and which makes possible the characterization, calibration, and comparison of different opto-acoustic detectors. The laser-acoustic air pollution monitor (spectrophone) measurements performed indicate that the intensity of the chopped laser beam in a spectrophone is described by a squarewave function. Experimentally obtained detector parameter values are reported, and experimental spectrophone characteristics are presented. A new test system for characterization of laser gas concentration monitors is used for the measurements and is capable of producing different trace gas concentrations in clean air at different total pressures, working dynamically by continuously producing new gas with a chosen concentration. It is possible to have at least six different detectors tested in the detector test chamber at the same time. The test system can, by incorporating at least one detector, be used for actual air pollution measurements.

39441 **APTIC NO. 62842**

Saltzman, Bernard E., William R. Burg, and John E. Cuddeback

CONTINUOUS MONITORING INSTRUMENT FOR REACTIVE HYDROCARBONS IN AMBIENT AIR. *Preprint, Cincinnati Univ., Ohio, Dept. of Environmental Health, 19p., 1974. 18 refs.*

A total hydrocarbon analysis instrument was modified to make it capable of simultaneously monitoring reactive hydrocarbons. Metered sample air flows were continuously pumped through an empty column and an absorbent column arranged in parallel. The air stream exiting from each column was directed alternately by a switching valve to a flame ionization detector. Quantitative measurements of the concentrations of total HC and of unreactive HC were made directly. The concentrations of the reactive HC removed in the packed column were obtained by the difference. Instrument characteristics and preparation of the recommended absorbent column are discussed. Solid absorbents and the factors affecting their ability to absorb various classes of HC were studied. Column dimensions, flow rates, and the temperature were adjusted so that a maximum of HC participating in atmospheric photochemical reactions were absorbed on a chromium trioxide- sulfuric acid column, while unreactive HC passed through the column unaltered. Monitoring data for Cincinnati are reported using this technique. The measurements of reactive HC should relate more closely to smog formation than those of total or nonmethane HC.

39442 **APTIC NO. 62415**

Schramel, P., K. Samsahl, and J. Pavlu

DETERMINATION OF 12 SELECTED MICROELEMENTS IN AIR PARTICLES BY NEUTRON ACTIVATION ANALYSIS. *J. Radioanal. Chem., 19(2):329-337, 1974. 12 refs.*

Dust samples were taken from six different stations in Munich and analyzed for arsenic, bromine, cadmium, chromium, copper, mercury, lanthanum, antimony, selenium, tin, and zinc. After radiochemical separation into four groups, the samples were examined by gamma spectroscopy and evaluated by computer. This neutron activation analysis gave good results.

39443 **APTIC NO. 61745**

Shibuya, Masao

APPLICATION OF ACTIVATION ANALYSIS TO DETERMINATION OF POLLUTANTS. *(Kankyo osen busshitsu no bunseki ni okeru hoshaka bunseki gijutsu no riyo). Text in Japanese. Aisotopu Nyuzu (Isot. News), no. 235-2-4, 1974. 9 refs.*

The use of activation analysis in the determination of air pollutants easily analyzed trace elements present in a very small quantity of a test sample which conventional methods failed to detect. An example of the application of method to the determination of air pollutants is the work of Mamuro in which the regional differences in the element concentration in the air of the Osaka area was examined by the determination of the concentration by weight of 31 elements by activation analysis for floating dust samples collected continuously day and night in 1971 and 1972 and for 16 metal elements in dust from jet engines, soot attached to the engine, and dust in the air in and around airports. Activation analysis is useful for the determination of trace pollutants such as substances attached to the surface of leaves and the black spot portion of plants, as well as usual pollutants, and permits the simultaneous analyses of many kinds of elements present in a sample. And a combined method of the gamma-ray spectrometry using the Germanium (Lithium) detector and the spectrum analysis using the computer enables one to analyze many samples in great quantities. The Atomic Reactor Laboratory of Kyoto Univ. has launched a technical study society for the activation analyses of environmental samples.

39444 **APTIC NO. 62479**

Shimo, Michikuni and Yukimasa Ikebe

PARTICLE SIZE MEASUREMENT METHODS FOR SUBMICRON AEROSOLS. *(Sabumikuron erozoru no ryudo sokuteiho). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 11:2-22, Jan. 1974. 41 refs.*

The measurement methods for submicron aerosols include electron microscopy, the use of electric mobility, dispersion coefficients, and utilization of precipitation speed. An ordinary optical microscope can measure particles of 0.00001 cm radius, but an electron microscope can measure particles with a radius of 10 to the -7th power cm radius. Photographic recording is also possible with this method. Sampling is difficult, especially with volatile or liquid particles which cannot be captured without changing their qualities. With the use of electric mobility, measurement is possible for particles of 10 to the -8th power cm radius. The total particle distribution can be calculated by the ratio of electrified particle mobility distribution, or by electrifying the total particles. The Israel method, the Misaki method, the Whipple method, and the multiple electrification method with mathematical formulas are discussed. The basic principle of the use of dispersion coefficient, the method of conversion of dispersion coefficient to particle size, the dynamic method, methods of counting nuclei such as Pollack, Aitken, Fog Tube equipment, and polydisperse aerosol analyses by Fuchs, T-S, Thomas, Sinclair, and Ikebe are discussed.

39445 **APTIC NO. 62029**

Smith, Ronald D.

THE DETECTION OF TRACE IMPURITIES IN AIR. *Preprint, 21p., 1974. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 25th, Cleveland, Ohio, 1974, Paper 398.)*

A system for the detection of trace impurities in the 1 ppm to the 1 ppb range was constructed using a Finnigan Quadrupole Mass Spectrometer incorporated in a specially designed vacuum system with a variety of inlets. Room air can be monitored by simple drawing the air over the membrane. For analyzing samples from other locations these can be collected in glass sample bottles. The detection performance of the system was successfully tested by contaminating room air with solvent vapors and hydrocarbons and analyzing them. Specific uses besides general pollution activities could include the monitoring of leakages from chemical and nuclear plants and anesthetic gases in an operating room.

39446 **APTIC NO. 62807**

Spurny, Kvetoslav and Werner Stoeber

FILTRATION, SAMPLING, AND ANALYSES OF FIBROUS AEROSOLS BY MEANS OF NUCLEOPORE FILTERS (PRELIMINARY RESULTS). *(Filtration, prelevement et analyse des aerosols a fibres par les filtres nucleopores. (Quelques resultats preliminaires)). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Inst. Atmos. Polluees, 11th, Paris, France, 1974, p. 22-1-22-10. 11 refs. (May 8-10.)*

Preliminary results of the filtration and sampling of chrysotile, crocidolite, and amosite fibers by means of series-connected nucleopore filters with a pore diameter of 0.1-8 micron were studied by electron microscopic investigation of the exposed filters. The sampling rate was varied from 1 to 30 cm/sec. Interception and impaction seemed to be the basic mechanisms of the separation of asbestos fibers by nucleopore filters. Interception was especially prevalent in the separation of chrysotile. Regular-shaped fibers in the form of smooth cylinders tended to align parallel to the flow rate direction through the filter, and thus the penentration of amosite and crocidolite was greater than that of chrysotile. The pressure loss increased very slowly even when the pores were totally filled with fibers. Practical asbestos fiber concentration measurements in urban air revealed a concentration of 1000 to 10,000 fibers/cu m.

39447 **APTIC NO. 61942**

Stedman, Donald H. and Philip A. Meyers

INSTRUMENTAL ANALYSIS IN ENVIRONMENTAL CHEMISTRY--GAS PHASE DETECTION SYSTEMS. *Bioscience, 24(5):277-282, May 1974. 40 refs.*

Instrumental analysis in environmental chemistry using gas phase detection systems is reviewed. Atomic absorption spectrophotometry utilizes the sharp, strong optical transition of metal atoms in the visible and ultraviolet portion of the spectrum. Ultraviolet visible analysis techniques include the ozone monitor and chemiluminescence methods. Strong characteristic responses to infrared analysis are made by molecules such as carbon monoxide, sulfur dioxide, carbon dioxide, nitric oxide, and gaseous hydrocarbons. Microwave spectrometry can measure without preconcentration only down to a few ppm of such species as SO2, nitrogen dioxide, or formaldehyde. Instrumental total organic carbon (TOC) analyzers can measure the amount of CO2 directly using a nondispersive infrared spectrometer or a thermal conductivity detector. Closely related to TOC analyzers are carbon-hydrogen-nitrogen analyzers. These instruments perform on the basis of measuring the combustion products of a sample. A recent development in environmental monitoring using gas chromatography is the determination of airborne CO, methane, and total hydrocarbons. For environmental monitoring, mass spectrometry is probably the most costly and least portable method of any system. It has very little application to air monitoring. Other systems in developmental stages include remote sensing and solid state sensors.

39448 **APTIC NO. 62789**

Stern, Arthur C.

LONG PATH AMBIENT AIR QUALITY MONITORING. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 2-1-2-10. (May 8-10.)*

Ambient air quality monitoring stations or networks include fixed, temporary fixed, moving, satellite, fixed long path, temporary long path, and fixed long path monitoring stations with a sensor at a fixed or moving target. Fixed long path monitoring stations and networks are discussed including instruments such as transmissometers, lidar, and sun photometers. The geometry of long path monitoring is described. Instruments which could be used in long path ambient air quality monitoring do not yet exist, so the idea is only hypothetical. However, only by conceptualizing such networks, their operation, their disadvantages and advantages, can the stage be set for their possible eventual development.

39449 **APTIC NO. 61827**

Tappi, J.

COMPARISON OF NOX METER. *(NOx sokutei keiki no hikaku) Text in Japanese. Kami-Pa Gikyoshi (J. Japan. Tech. Assoc. Pulp Paper Ind.), 28(6):30-31, June 1974.*

The characteristics of non-dispersive infrared meter, chemiluminescence meter, and ultraviolet spectrometer for measuring nitrogen nitrogen were compared. After inspecting various products on the market, the range of measurements, accuracy, reliability, drifts, response speeds, the influences of coexisting gases, manufacturers, and converters were presented in a table. The chemiluminescence meters are the most reliable. NDIR is relatively inexpensive and it has a good record of performance as a meter for sulfur dioxide and other gases. The chemiluminescence analyzer can measure very low range of NOx concentration. The UV analyzer requires no converter, and it is relatively free of interference from other gases in the air or soiled cell window and lamp fluctuations. Disadvantages of each type are: NDIR measurements in the low range are unreliable, both chemiluminescence and UV analyzers are expensive, UV s low range measurements are unstable, and the chemiluminescence analyzer is easily affected by fluctuation of gas flow.

39450 **APTIC NO. 62765**

Thompson, Kenneth Clive

METHOD AND APPARATUS FOR DETECTING MERCURY VAPOUR IN A GAS. *(Shandon Southern Instruments, Ltd., Surrey (England)) Brit. Pat. 1,346,081. 3p., Feb. 6, 1974. (Appl. March 3, 1971, 9 claims).*

A method and apparatus for detecting and measuring mercury in low concentration in a gas are described. The gas enters into an interaction zone and is subjected to radiation from a Hg vapor lamp. The intensity of atomic fluorescence from the zone is measured with the aid of a solar blind photomultiplier or detection system capable of detecting radiation at a wavelength of 253.7 nm. The apparatus consists of a tube through which the gas enters the zone, the Hg lamp, and the photomultiplier.

39451 **APTIC NO. 61799**

Wal, J. F. van der

COMPARISON OF THE FINE DUST CONCENTRATION BY VARIOUS MEASUREMENT METHODS. *(Vergelich der Feinstaubkonzentration nach verschiedenen Messverfahren). Text in German. Staub, Reinhaltung Luft, 34(4):128-129, April 1974. 7 refs.*

In the years 1969 to 1973 measurements of the fine dust concentration were taken with different units of which the results are directly comparable. The results of these comparative measurements are described and compared with theoretical results. The fine dust concentrations were determined by two different separating methods, firstly, separation of the total fraction below 5 micron at a density of 2.65 g/cu cm and secondly, separation of 50% at 5 micron at a density of 1 g/cu cm. Two samplers were set up next to each other in the ceramic industry and in the iron and steel industry; a Gromoz, which is a filter unit with a sampling speed to 1.25 m/sec with an air throughput of 50 cu m/hr, and a personal air sampler by Caselly. From the cumulative frequency distribution of the ratio of the fine dust concentration to the sharp separation at 5 micron it follows that the median of 38 measurements is 0.7. The value which is exceeded in 5% of the cases is 2.4; the 5% value is 0.10. The deviation range is far greater for the iron and steel industry than for the ceramic industry. These measurements yield a 40% larger median conversion factor than the theoretically calculated factor. This shows that a conversion of the fine dust concentration obtained with different separating methods is basically feasible but the deviation range is large.

39452 **APTIC NO. 62591**

Walter, R. L., R. D. Willis, W. F. Gutknecht, and J. M. Joyce

ANALYSIS OF BIOLOGICAL, CLINICAL, AND ENVIRONMENTAL SAMPLES USING PROTON-INDUCED X-RAY EMISSION. *Anal. Chem., 46(7):843-855, June 1974. 16 refs.*

A 3-MeV beam of protons of 2-150-nanoampere intensity was used to excite X-ray emission from a wide range of biological and environmental samples including coal and fly ash. The proton-induced X-ray emission analysis (PIXEA) was compared to the conventional X-ray fluorescence technique for measuring air pollutants collected on various membrane filters. A number of tests were conducted for the Environmental Protection Agency and and PIXEA proved to be moderately practical. A large number of metals can be clearly recognized. Elements of interest include calcium, nickel, iron, titanium, lead, and bromine, the latter four being constituents of fuel oil, coal, and/or gasoline. The use of a thin filter is very important for accurate results. For all samples the X-rays were detected using a silicon(lithium) solid state detector for the elements phosphorus through Pb. Linear response was demonstrated for the typical elements of Pb, copper, zinc, cobalt, and manganese from 5 ng to greater than 2 micrograms. A lower limit of sensitivity of approximately 200 picograms in the irradiated area was attained with the more responsive elements when they are deposited on very thin substrates.

39453 **APTIC NO. 62394**

Wolbach, C. Dean

APPROXIMATIONS TO DISCREPANCIES BETWEEN VISUAL AND INSTRUMENT OPACITY READINGS FOR SUBMICRON PARTICULATE MATERIAL. *Environ. Sci. Technol., 8(5):458-459, May 1974. 2 refs.*

Control agencies are beginning to encounter numerous conflicts between instrument and visual opacity readings. Theoretical approximation to the magnitude of such discrepancies can be made. A mathematical formula for approximating discrepancies between visual and instrument opacity readings is derived. Some values for these discrepancies are plotted, and a specific case is calculated. (Author abstract)

39454 **APTIC NO. 62417**

Wolf, Philip C.

SYSTEMS FOR CONTINUOUS STACK-GAS MONITORING. PART 2: GAS-HANDLING COMPONENTS AND ACCESSORIES. *Mech. Eng., 96(5):43-48, May 1974. 8 refs.*

The usefulness of values obtained in industrial gas analysis with continuously operating analyzers depends not only on the measuring accuracy and quality of the individual sensor, but also on the overall design of the analysis system. Selection of appropriate components and accessories and their proper arrangement are major factors in obtaining reliable values and in achieving maintenance- free and trouble-free operation. Sampling probes, dust filters, cooler-condensers, adsorption and absorption devices, pumps, sample-gas tubing, automatic gas-switching valves, automatic calibrators, filters, flowmeters, reducing valves, and calibration gases are described and discussed. The arrangement of these components in a stack gas monitoring should be sampling probe, dust filter, cooler, adsorption or absorption filter, flowmeter, and pump.

39455 **APTIC NO. 62116**

Yoshioka, Naoya

WET TYPE CLASSIFICATION -- CENTERING AROUND HYDRAULIC CYCLONE. *(Shisshiki bunkyu -- Ekitai saikuron o chushin ni). Text in Japanese. Preprint, Japan Society of Materials Science, Kyoto, p. 117-128, 1974. 3 refs. (Presented at the Symposium on Pulverization and Dust Control, Kyoto, Japan, Feb. 20-21, 1974.*

In the wet type size classification method, particles are divided into two groups by taking advantage of the difference in their precipitation speeds in a liquid (usually water). The wet type classifiers presently in use include the non-mechanical, mechanical, hydraulic, and centrifugal types. Performance data of the representative wet type classifiers are shown. A hydraulic cyclone is theoretically and structurally similar to a gas cyclone and operates on the principle of centrifugal force. It is of simple construction having no moving parts except for the feeder pump. Despite the compact size, it has greater handling capacity as well as higher classifying efficiency. It can be combined with a pulverizer system, and with filter and thickener units. The basic construction of a hydraulic cyclone is illustrated. Pressure loss and flow ratio of a hydraulic cyclone are fully discussed in relation to other structural and operational factors. The classification performance of a hydraulic cyclone is expressed in terms of the partial recovery rate which represents weight percentage of the proportion of particles of a given diameter removed through the apex opening provided in the bottom of the cyclone. The partial recovery rates were calculated in relation to the grain size and flow ratio and plotted on a graph to produce the partial recovery rate curve. Based on these data, the standard corrected recovery rate curve was produced. The nomograph depicting the relationship between the cyclone diameter, pressure loss, flow rate and 50% grain size is also shown.

39456 **APTIC NO. 62770**

(Inventor not given.)

IMPROVEMENTS IN AND RELATING TO AEROSOL DETECTION. *(Telefonaktiebolaget L M Ericsson, Stockholm (Sweden)) Brit. Pat. 1,342,266. 5p., Jan. 3, 1974. (Appl. July 15, 1971, 21 claims).*

An aerosol detector with two measuring chambers was developed. One chamber is arranged for rapid and the other chamber for slow entrance of aerosol from the surrounding air. There is a means for making a comparison in respect of electromagnetic radiation that has travelled in the respective chambers to produce a signal indicating comparative aerosol concentration in the two chambers. The detector can be used in conjunction with a fire alarm system to detect the aerosol products of combustion.

39457 **APTIC NO. 62772**

(Inventor not given.)

APPARATUS FOR USE IN DETECTING OR MEASURING GAS OR DUST. *(Dragerwerk Aktiengesellschaft, Lubeck, (Germany)) Brit. Pat. 1,344,430. 8p., Jan. 23, 1974. (Appl. Sept. 18, 1972, 17 claims).*

An apparatus for use in detecting or measuring gas or dust is described. The apparatus consists of a chamber in the interior of a bellows with a moveable wall connected to a measuring means for detecting the gas or dust. Means are provided for varying the volume of the chamber. Movement of the wall in one direction produces a suction in the chamber. This apparatus has the advantage over similar ones in that the suction inducing device can be very simple in construction and can include a bellows. The energy consumption of the suction inducing device can be relatively small.

1973

39458 **APTIC NO. 62496**

Ando, Hiroshi, Masuo Nishiyama, Hidenori Tanaka, and Yoichi Mimura

INDIRECT ESTIMATION OF RESIDUAL HYDROCARBONS IN COMBUSTORS. *Mem. Def. Acad. Japan, 8(3,4):425-435, Dec. 1973. 5 refs.*

Combustion products produced in a combustor were sampled with a water-cooled sampling probe and analyzed with a thermal conductivity detector type gas chromatograph. Even if each amount of unburned residual hydrocarbon existing in burned gas could not be analyzed by this method, the estimation of the amount of residual hydrocarbons excluding detected hydrocarbons could be obtained indirectly from the result of the composition analysis using element conservation relations. In this study several factors concerning experimental reliability were investigated and the results were in good agreement with those of a direct quantitative analysis of residual hydrocarbons using the flame ionization detector type gas chromotograph. A combustor with a multi-hole injector was employed and the premixed gas of propane and air was burned under an intense turbulence. The results showed the usefulness of this method for the analysis of combustion characteristics. (Author abstract)

39459 **APTIC NO. 62174**

Beckett, S. T.

THE EVALUATION OF AIRBORNE ASBESTOS FIBRES USING A SCANNING ELECTRON MICROSCOPE. *Ann. Occupational Hyg., 16(4):405-408, Dec. 1973. 5 refs.*

Asbestos fibers sampled on Nuclepore filters can be directly examined by the scanning electron microscope in much greater detail than is possible using the conventional optical microscope/ membrane filter technique. Results obtained by the two methods for fibers greater than 5 micron in length were in good agreement. The new technique could facilitate the development of automatic counting methods for asbestos fibers. The scanning electron microscope has three major advantages over the optical microscope in this application: increased depth of focus; higher resolution; and greater contrast between fiber and background. The first advantage enables all fibers to be focused at one microscope setting. The other two facilitate the detection of the finer fibers and increase the precision of the size distribution measurements down to the diameter of the finest fibrils. The use of the scanning electron microscope should reduce observer counting errors in the standard size range.

39460 **APTIC NO. 61679**

Bennett, T., D. Cavers, and J. M. D Auria

FAST NEUTRON ACTIVATION ANALYSIS. HIGH RESOLUTION GAMMA SPECTROSCOPY. *J. Radioanal. Chem., vol. 13:201-212, 1973. 9 refs.*

The versatility of combining the use of high resolution germanium (lithium) gamma-detectors with the techniques of fast neutron activation analysis was demonstrated. A compilation of gamma ray spectra are presented for irradiation of 30 metal and crystalline elements with 14.8 MeV neutrons under standard conditions and the origin of all major photopeaks is determined. This technique has considerable usefulness in such work as pollution studies, crime detection work, analysis of mining samples, and analysis of biological samples where a nondestructive analysis of the major elemental composition is required from samples containing many elements, both quickly and accurately. (Author abstract modified)

39461 **APTIC NO. 61659**

Brunkow, David and G. M. Morgan, Jr.

METROMEX RADAR STUDIES. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 103-111, 1973. 2 refs.*

Radar equipment used as a complement to the raingage network of the Metromex project, a large-scale investigation of inadvertent weather modification in the St. Louis area are described. Comparative radar-rainfall studies over the network are expected to yield information for determining whether or not the radar can supplant some or all of the raingages in future field programs and whether or not the radar can be utilized in lieu of the gages in areas outside of the network. Sample results are given for recordings from FPS-18 and TPS-10 radar units. The display and examination of three-dimensional radar data as furnished by the TPS-10 unit, one of the common problems of radar- oriented research, is nearly solved with the development of computer programs which perform the following: constant altitude radar display, vertical sections in arbitrarily oriented planes, determination of the distribution with height of the mass of precipitation in the storm, calculation of the total liquid water mass of storms, and calculation of the volume versus height and total volume of the radar echo. Diagrams are provided illustrating these functions.

39462 **APTIC NO. 61642**

Cardina, J. A.

THE DETERMINATION OF RUBBER IN ATMOSPHERIC DUSTS. *Rubber Chem. Technol., 46(1):232-141, March 1973. 6 refs.*

Samples of airborne dusts were collected near heavily traveled highways and analyzed for rubber by pyrolysis gas chromatography. Dust samples obtained in truck traffic gave pyrolysis chromatograms markedly different from those obtained in passenger car traffic, and which correspond with those derived from known tire tread compounds. The distinction was based on the presence of styrene or dipentene in the pyrolyzates. Quantitative determination of dusts from the Pittsburgh Liberty Tunnel and the Akron Expressway Interchange show the presence of 1.5 to 2.5% rubber, whereas dust from a residential area shows about 0.25%. Methods were developed for sampling atmospheric dusts and preparing small amounts in a form suitable for pyrolysis. (Author summary)

39463 **APTIC NO. 62266**

Chubb, T. W. and J. B. Abbiss

PARTICLE SIZE MEASUREMENT BY IN-LINE HOLOGRAPHY. TECHNICAL REPORT. *Ministry of Defence, Farnborough (England), Royal Aircraft Establishment, Rept. 72229, IR 130, BR 34763, 49p., March 1973. 29 refs.*

NTIS, DDC: AD 768178

Particle size measurement by in line holography and its application for the determination of particle size in clouds and sprays are described. Holography provides a method or reproducing images of small particles dispersed in a volume without the severe difficulty of the limited depth of field of conventional photography and without the disturbance to the sample of collection methods. The size and position of particles may be determined by this method, and by extension to double exposure techniques the velocity may also be found. In line Fraunhofer systems are shown to be especially suitable for particle diameters in the 5 to 500 micron range, provided the maximum recording distance (particle to hologram) does not exceed certain limits set by the smallest particles. The system developed by Silverman to study fog droplets is extended and examined as a practical device. The theory of the method is given and factors limiting it are discussed. A number of experiments were performed, and the results are related where possible to theory. (Author summary modified)

39464 **APTIC NO. 62334**

Coney, Thom A. and Jack Salzman

DETERMINATION OF THE TEMPERATURE OF GAS MIXTURES BY USING LASER RAMAN SCATTERING. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-04, NASA-TN D-7126, E-7045, 35p., Jan. 1973. 17 refs.*

NTIS: N-73-15525

A theoretical model of the Raman rotational spectrum of a gas mixture was formulated and applied to an air mixture of oxygen and nitrogen. Theoretical spectra was calculated as a function of temperature and compared directly to spectra obtained experimentally. The comparison, made at temperatures within the range 243 to 313 K, showed the model to be accurate. An error analysis was then performed yielding the theoretical and experimental temperature measurement accuracies. The theoretical error predicted for the temperature range was + or - 20 K, which compared with experimental data. Within the limits of this experiment and the preceding accuracies, the temperature of a gas mixture can be measured by using Raman scattering. (Author summary modified)

39465 **APTIC NO. 62628**

Cross, N. L. and R. G. Picknett

GROUND CONTAMINATION BY FUEL JETTISONED FROM AIRCRAFT. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 12-1-12-9. 9 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Ground pollution produced by fuel jettisoned from aircraft under emergency conditions, typically at 450 kg/min through a pipe 6 cm in diameter while flying at 120 m/sec was investigated. The probable size distribution of drops produced when fuel is jettisoned by aircraft was assessed. Trials are reported in which a Buccaneer aircraft jettisoned fuel at low altitude and the size distribution was measured at ground level. This spray represents a lower boundary to the initial sizes of drops produced by civil aircraft. The proportions of jettisoned fuel which survive evaporation to reach the ground are presented as functions of the initial drop size distribution, the fuel type, the height of jettisoning, and the ground temperature. Under adverse combinations of these factors large quantities of fuel may reach the ground. The contamination density on the ground depends on atmospheric stability, wind speed, and orientation of flight to wind direction, as well as the amount of fuel reaching the ground. Only order of magnitude calculations have been made, but at fairly typical conditions with cross wind flight at 300 m altitude. Avtur fuel can contaminate a strip of land about 4 km wide to a density of a few mg/sq m. (Author summary modified)

39466 **APTIC NO. 62340**

Decker, C. E., T. M. Royal, and J. B. Tommerdahl

PROGRAM FOR UPGRADING THE NO2 INSTRUMENTATION EMPLOYED IN THE 1972 CHATTANOOGA NO2 EXPOSURE STUDY (FINAL REPORT). *Research Triangle Institute, Research Triangle Park, N. C., Measurements and Device Research Dept., Coordinating Research Council, Inc. CRC-APRAC Proj. CAOM-10-71, 105p., 1973. 16 refs.*

NTIS: PB-226235

The nitrogen dioxide monitoring capabilities for the Chattanooga Health Effects study were upgraded by incorporation of chemiluminescent nitric oxide-nitrogen oxides-nitrogen dioxide monitoring instrumentation and automatic data acquisition systems at seven of the nine monitoring sites in Chattanooga. Chemiluminescent NO-NOx-NO2 analyzers, automatic data acquisition systems compatible with the Environmental Protection Agency Community Health and Environmental Surveillance System (CHESS) data analysis scheme, and 8 by 10 ft shelters equipped to maintain the environment necessary to insure proper operation of the monitoring equipment were selected and procured. After installation and checkout of shelters, analyzers, and data acquisition equipment in Chattanooga, the seven facilities were operated for the remainder of the year. Seven months of chemiluminescent NO2 field data were obtained from two sites during the first year, April 1972 to April 1973, and 6 mo at the other five sites. The data were reduced and processed by the EPA. The necessary quality control procedures including dynamic calibration and examination of data at various points in the data processing program were initiated to assure the validity of the NO2 data. (Author abstract modified)

39467 **APTIC NO. 62159**

Dodgson, J. and W. Whittaker

THE DETERMINATION OF QUARTZ IN RESPIRABLE DUST SAMPLES BY INFRARED SPECTROPHOTOMETRY-I. THE POTASSIUM BROMIDE DISC METHOD. *Ann. Occupational Hyg., 16(4):373-387, Dec. 1973. 24 refs.*

Experience with the infrared method for the determination of quartz in respirable dust samples using the well-known potassium bromide technique is summarized. The experimental problems are discussed and the precision of the technique is assessed by calibration with standard 5-micron quartz. The infrared method is compared with X-ray diffraction for the analysis of coal mine dusts and the two methods gave analogous results. On the average the differences between the techniques amount to less than 1% quartz in ashed samples. A micro-disc method is also described which has enabled microgram quantities of sample to be analyzed. (Author abstract modified)

39468 **APTIC NO. 62754**

Ferguson, Richard A.

FEASIBILITY OF A CW LIDAR TECHNIQUE FOR MEASUREMENT OF PLUME OPACITY (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-0543, Program Element 1A1010, Rept. EPA-650/2-73-037, 101p., Nov. 1973. 16 refs.*

NTIS: PB-231 992/AS

The feasibility of a continuous wave laser radar (CW lidar) for the remote measurement of smoke plume opacity was investigated. The analysis, design, fabrication, and limited field evaluation of a laboratory model CW lidar are described. The technique involves modulating the intensity of the laser beam at a frequency that changes rapidly and linearly with time. A portion of the transmitted signal is mixed electronically with the light reflected from the targets in a device similar to a radio receiver. Each target appears at a particular frequency. Both the range and the opacity of semitransparent targets were measured over distances of 100 to 200 m. Investigations into actual system performance, operating characteristics, and remote transmission measurement capability using components available at reasonable cost within the state of the art are reported. (Author abstract modified)

39469 **APTIC NO. 62080**

Foster, J. F. and G. H. Beatty

FINAL REPORT ON INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION AND ACCURACY OF THE MEASUREMENT OF SULFUR DIOXIDE CONTENT IN THE ATMOSPHERE USING ASTM METHOD D 2914. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., American Society for Testing and Materials Data Series 55-2, 84p., Sept. 21, 1973. 11 refs.*

Statistical analysis of 704 measurements of sulfur dioxide over the concentration range of about 7-300 micrograms/cu m in ambient air and spiked-ambient air at Los Angeles, California; Bloomington, Indiana; and Manhattan, New York was performed to determine the accuracy and precision of the American Society for Testing and Materials Method D2914 for measuring sulfur dioxide in the atmosphere. The results indicated that the average standard deviation, sb, for variations among single measurements taken by different laboratories was related to the mean concentration of SO2, m, by the expression: sb equals 1.61 times the square root of m. The average standard deviation, sw, for variations among repeated measurements within laboratories was found related to the mean concentraton, m, by the expression: sw equals 0.701 times the square root of m. The bias of the measurements of the SO2 recovered from spiked ambient samples was minus 22, minus 6, and minus 4% at Los Angeles, Bloomington, and Manhattan, respectively. The bias did not appear to be dependent on concentration. The tendency of simultaneous measurements made by the laboratories during successive time intervals to increase or decrease together was measured by correlation coefficients; and a total of 140 correlations showed that 118 (84%) yielded correlation coefficients that were statistically significant at the 95% level. The estimated minimum concentration of SO2 that could be detected based on statistical considerations was about 4 micrograms/cu m. (Author summary modified)

39470 **APTIC NO. 61801**

Fukushima, Hiroshi, Tatsukichi Ishiguro, Yoshiteru Iwasaki, Haruyoshi Onozuka, and Toshio Ohira

STUDIES ON EVALUATION METHODS FOR BAD ODOR POLLUTION (NO. 3): THE TRIANGLE TEST COMPARISON BAG METHOD AND EXAMINATION OF THE NUMBER FOR THE ODOR PANEL. *(Akushu kogai no hyoka hoho no kenkyu (dai3po). Santen Hikakushiki shutaiho no kairyo to paneru ninzu no kento). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept., Tokyo Met. Environ. Prot. Res. Inst.), no. 5:32-36, March 1973. 2 refs.*

A simplified, quick method of odorimetry is described and the minimum number of panel members was determined. Three mylar bags are prepared and two are filled with odorless air. The third contains odorless air, but an odor element is injected to produce a clearly recognizable odor dilution. The multiple is determined prior to the test by smelling the odor. Initial test may begin with a 30-multiple dilution. Thy panel members sample the bags, and when the answer is correct, the dilution multiple is increased and the test is continued. Dilution multiples may progress from 30 to 100, to 300, and to 1000. When individual answers become incorrect or unclear, the test is stopped. The degree of odor concentration is determined by taking the middle point between the lowest concentration correctly detected by the panel, and the level the panel s answer was incorrect. After testing panels with various numbers of members and various odors, a four-member panel gave more than 80% correct measurements within 10% + or - errors.

39471 **APTIC NO. 61060**

Guilbault, George G.

A STUDY OF GAS SOLID REACTIONS. (FINAL REPORT). *Louisiana State Univ., New Orleans, Chemistry Dept., DA ARO Grant D 31-124-70G69, Rept. 6964.11-C, 10p., June 1973. 12 refs.*

NTIS, DDC: AD-767 286

Infrared spectroscopy and oscillating crystals were used to investigate specific adsorbents for inorganic and organic gaseous pollutants such as organophosphorus compounds, organic nitrogen, sulfur dioxide, nitrogen oxides, and nitrate. The most promising adsorbents for various classes of compounds were placed as coatings on a piezoelectric crystal detector, and the device was evaluated as a possible detector for the identification and assay of these compounds. The detector and each adsorbent were evaluated with respect to sensitivity and linearity of response, speed of response, response accuracy, reversibility, and limit of detection. Carbowax 20M was a good adsorbent for SO2, and an iron trichloride-organophosphate complex was good for adsorbing organophosphorus compounds.

39472 **APTIC NO. 61660**

Huff, F. A. and A. L. Sims

RELATED STUDY ON QUANTITATIVE MEASUREMENT OF SURFACE RAINFALL WITH RADAR. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Gr8nts GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 112, 1973.*

A study on quantitative measurement of surface rainfall with radar which is related to the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis, is briefly described in terms of ethods and techniques being developed. Computer programs are being developed to calculate the raingage-indicated and radar-indicated rainfall over specific areas of varying size and for varying times. These processed data will then be used in evaluating the reliability and accuracy of radar for quantitative precipitation measurements. The capability to measure rainfall quantitatively with radar with an accuracy approaching that of dense raingage networks is seen as a major asset in the evaluation of weather modification experiments and in hydrologic applications.

39473 **APTIC NO. 62381**

Ishiguro, Akira, Kanau Hayashi, Toru Taten, yukimasa Ikebe, and Michikuni Shimo

EXAMINATION OF ATMOSPHERIC RADON CONCENTRATION MEASUREMENT METHODS. *(Taikichu no radon nodo sokuteiho ni kansuru kento). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9:7-10, Aug. 1973. 4 refs.*

The radon concentration in the air have been measured, but the various known methods of measurement have never been compared. The methods include: direct capture of material gas in an ionization box, the carbon trap method, the filter pack method, and the double filter method using a decay chamber. In this experiment, the second and third methods were compared. Theoretically, the amount of carbon should be about 10 g which should suffice for a 00% capture of less than 0.5 times 10 to the -8th power ci of radon. Desorption is achieved at 200 C for 5 min. The desorbed material gas is enclosed in the ionization box through calcium chloride for dehumidification. The measurements were adjusted by the Monte Carlo calculation. The filter pack method is simple but the radiation balance among nuclei must be obtained for accurate Rn measurement. The filter utilized was 0.3 micron and the flow rate was up to 5 l/min. The correlation between the charcoal-trap method and the filter-pack method was extremely good for a limited number of measurements.

39474 **APTIC NO. 62633**

Joatton, R.

MEASUREMENTS OF TRACE COMPONENTS IN THE STRATOSPHERE BY THE CONCORDE 001. *(Mesures des constituants mineurs dans la stratosphere par Concorde 001). Text in French. North atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 17-1-17-7. 4 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Instrumentation on-board a Concorde 001 for ½the determination of the vertical profiles of the nitric oxide, nitrogen dioxide, nitric acid, methane, carbon monoxide, ozone, and water vapor concentrations in the stratosphere is presented. The aircraft will be equipped with such instruments as a high-speed Fourier interferometer, an ONERA-type infrared spectrometer, and a solar flux meter.

39475 **APTIC NO. 62508**

Kobayashi, Hirokazu, Tatsuo Endo, and Osaharu Magono

A TRIAL MODEL FOR A REDUCED-PRESSURE AUTOMATIC RECORDER FOR AEROSOL CONCENTRATION MEASUREMENT. *(Genatsushiki earozoru nodo jiki sochi no shisaku). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.). no. 9:59-62, Aug. 1973.*

Automation of the condensation nuclei counter was attempted utilizing the principles of the Pollack counter with reduced pressure instead of added pressure. The apparatus is comprised of a cloud chamber with an orifice, a luminescent diode, an EMV switch and timer, a pressure box with timer, a bridge circuit, and a vacuum pump. The air enters the cloud chamber, continuously drawn by the vacuum pump, passes through the EMV and reaches the pressure box. The timer is set prior to the experiment and closes EMV stopping the air and the pressure beings to reduce. When the pressure reaches 400 mb, the EMV suddenly opens. The air in the cloud chamber expands and clouds form. Humidity is provided by soaking the filter paper in the cloud chamber wall. The structure is simple and small and apparatus will be portable; the light source can last as long as the supply of heat; the intervals between measurings is about 10 sec and is suitable for microscale experiments. The problems of the apparatus are: the cloud formation is instantaneous and the particle size distribution and stability are still unknown factors; at the present stage of development, only a relative calibration is possible; continuous use will increase the cost of water consumption; and since the sampling volume is small, the suction of material air as far as the entrance will have to rely on another method.

39476 **APTIC NO. 61851**

Kogai Mondai Kenkyukai

MEASUREMENT OF ATMOSPHERE. *(Taiki no sokutei). Text in Japanese. Kankyo Joho Kagaku (Environ. Inf. Sci.), 2(4):48-52, Dec. 1973.*

Methods of measurement and analysis of such pollutants and sulfur oxides, aerosol, carbon monoxide, nitrogen dioxide and oxidant have been formulated since 1969, and are mostly described by Japan Industrial Standards, such as JIS Z 8808, which is briefly explained. For sulfur oxides, JIS K 0103, and for its gas volume, JIS Z 8808 are applied. For sulfur content in petroleum fuel, the radio isotope method, JIS K 2273, JIS K 2547, JIS K 2541, or JIS K 2263, are applied. For dust, JIS Z 8808, for cadmium and its compounds and lead and its compounds, JIS K 0097, and for sample collection, JIS Z 8808 3 and 6 applied. For chlorine, JIS K 0106 (O-lysine method) and JIS K 0106 (continuous analysis method) are applied. For hydrogen chloride, JIS K 0107, and for fluorine, hydrogen fluoride, silicon fluoride, JIS K 0105, and for nitrogen oxides, JIS K 0104 are applied. For measurement of dust, JIS Z 8808, for carbon monoxide, JIS D 1030, for hydrocarbon, JIS D 1030, for lead compounds, the atom light absorption method and polarograph method, for nitrogen oxides, JIS K 0104, and for particles, JIS D 8804 are applied. In measuring automobile exhaust, JIS K 0099 is applied for ammonium, JIS K 0105 for hydrogen fluoride, JIS K 0109 for hydrogen cyanide, and JIS K 0098 for carbon monoxide. Methods of analyzing sulfur oxides, such as the neutralization method, iodine titration method, chloranil acid barium method, solution conductivity ratio method, infrared gas analysis method, and detector tube method, are compared. For aerosol, JIS Z 8813 and the volume air sampler method are applied.

39477 **APTIC NO. 62849**

Krugers, Johan Felix Jozef

GAS DETECTOR. *(Verfahren und Vorrichtung zum Detektieren eines Stoffes in der Gasphase). Text in German. (Philips Gloeilampenfabrieken (N. V.), Eindhoven (Netherlands)) W. Ger. Pat. Appl. 1,598,843. 4p., Oct. 25, 1973. 6 refs. (5 claims).*

A method and device for the detection of substances in gaseous or vapor phases in the air are described. The gas detector generates an electric glow discharge in an enclosed space, and analyzes the intensity and wavelength of the resulting radiation. The glow discharge is initiated in a pure, oxygen-free nitrogen atmosphere under about 1 atm pressure, and the substance to be detected is mixed with the nitrogen excited and activated by the glow discharge. The gas detector is suitable for the detection of carbon-containing compounds and of metal vapors. If the substance to be detected is a carbon-containing compound, radiations characteristic of cyanogen radicals are detected.

39478 **APTIC NO. 62338**

Labo, Jack Allen

THE THEORY OF AN ELECTROSTATIC METAL-PARTICLE SENSOR OPERATING IN A JET ENGINE EXHAUST. *Air force Inst. of Tech., Wright- Patterson AFB, Ohio, Dept. of Engineering, Air Force Flight Dynamics Laboratory, Graduate Engineering Physics, PH/73-13, 73p., June 1973. 22 refs.*

NTIS, DDC: AD-768351

An electrostatic probe was investigated as a charged metal particle detector in a jet engine exhaust from both a theoretical and experimental standpoint. The theoretical development concentrated on the electrostatic particle probe interaction problem. The mechanism by which a moving charged particle induces a voltage pulse in a probe sensing circuit was studied and a practical model for the particle probe system was developed. The resulting voltage pulses were explained by means of a capacitive equivalent electrical circuit. The interaction of an uncharged particle with a biases probe and the jet engine exhaust plasma effects are briefly discussed. A simple experimental setup was used to confirm thy predicted voltage waveform. A comparison of the predicted voltage pulses and experimental results show both agree with certain voltage pulses observed in actual jet engine exhausts from the older J-57 engine to the latest F-101 engine. (Author abstract modified)

39479 **APTIC NO. 62648**

Lucchesini, M. and D. Dini

PHOTOMETRIC MEASUREMENTS OF EXHAUST SMOKE TRAILS BY JET ENGINES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP- 125, p. 34-34-10. 3 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A photographic photometric method was developed to measure density and visibility of exhaust smoke trails, and an objective index for the smoke emission degree by turbojets during take-off and landing was obtained. Photographic photometry is based on light scattering theory. Assuming the light transmission percentage value, T, as an index of engine-contaminating level, tests show the P. W. JT8D9 as being one of the most contaminating jet engines on airline service, giving T values of about 74%. Transmission T values have been measured in many cases at different distances from the nozzle and for several angles between optical and trail axes. The dependence of T from the aerodynamic airplane/engine configuration and from the optical path L through the trail is shown. A similar method was adopted from the IIT Research Institute and a comparison between the results is made. (Author summary modified)

39480 **APTIC NO. 62315**

Mack, Dick A., Craig D. Hollowell, and Ralph D. McLaughlin

TECHNIQUES FOR CONTINUOUS MONITORING OF HYDROCARBONS. *California Univ., Berkeley, Lawrence Radiation Lab., National Science Foundation Grant AG-271, Atomic Energy Commission Contract WN7408- ENG-18, 39p., 1973. 36 refs. (Presented at the American Society for Testing and Materials, Environmental Protection Agency, and National Center for Atmospheric Research, Conference on Instrumental Monitoring for Ambient Air, Boulder, Colo., Aug. 14- 16, 1973.)*

NTIS: LBL-2099, Conf. 730838-1

Techniques used in present commercial instrumentation and ideas which merit further investigation for the analysis of gaseous hydrocarbons in the atmosphere are reviewed. The present methods for analyzing HC to perform ambient air, stationary source, and vehicular emission monitoring are flame ionization detection, gas chromatography, nondispersive infrared spectroscopy, dispersive infrared spectroscopy, and catalytic oxidation. These methods are reviewed and compared. Promising methodology includes ultraviolet spectroscopy, optoacoustic detection chemiluminescence, and other methods such as mass spectrometry, remote sensing, thin- film indium sesquioxide detectors, and microwave rotational spectroscopy. Problems associated with the production of improved instrumentation are discussed, and recommendations are made for further research and development. Present air quality and emission standards are reviewed with respect to required analytical methods. The present HC monitors can be used to measure total HC; a subtraction method is needed to measure nonmethane HC. Individual HC can be measured with gas chromatography. Infrared and ultraviolet spectroscopy appear to be promising dispersive spectroscopy techniques. (Author abstract modified)

39481 **APTIC NO. 61885**

Matsumura, Ikutoshi

A PRACTICAL ANALYZER FOR TRACE ODOR COMPONENTS IN THE ATMOSPHERE. *(Jitsumuteki na taikichu biryo shuki seibun no bunseki ni tsuite). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 15(6):300-302, Dec. 1973.*

The odor analyzer described here is composed of a sampler, an odor dismissing apparatus, and a gas chromatograph. Odors are passed through a drying tube, which is immersed in an isopropyl alcohol bath at -28 to -30 C, and are concentrated in an U tube, which is packed with C-22 adsorbent treated with acid and is cooled at -78 C in a dry ice-isopropyl alcohol bath. The U tube can be detached from the sampler to be sent to a desired location for analysis. A heater is used to heat the U tube to drive the odor into the column of the gas chromatograph with the aid of a carrier gas, and sulfur dioxide is analyzed with a flame ionization detector while other organic compounds are analyzed with a flame photometric detector. A column packed with silicone grease/ chromosorb G was found to be able to detect 0.001 to 0.01 ppm of sulfur oxides and 0.01 to 0.05 ppm of hydrocarbons, using nitrogen as carrier gas.

39482 **APTIC NO. 62626**

Meinel, H. and T. Just

A NEW ANALYTICAL TECHNIQUE FOR CONTINUOUS NO DETECTION IN THE RANGE FROM 0.1 TO 5000 PPM. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 8-1-8-5. 9 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A new analytical technique for continuous nitric oxide detection in the range from 0.1 to 5000 ppm is described. It is similar to the technique of atomic resonance absorption spectrometry. The source radiation of NO is passed through an absorption cell supplied by the engine exhaust gas and the amount of radiation absorbed by the NO molecules in the gas is measured. As source lamp for NO, a hollow cathode discharge tube has been developed producing very strong and sharp rotational lines. The spectral band-pass of the monochromator is about 20 A. Background absorption due to soot, oil droplets, and molecular species is checked and compensated for by means of a nearby Bi-line from a Bi-hollow cathode source. For this reason, the light from the No- and Bi-source is alternately passed through the absorption cell and the ratio of the two resulting signals is measured. (Author abstract modified)

39483 **APTIC NO. 61915**

Mizuta, H.

STUDIES ON MEASUREMENTS OF PASSING AIR VOLUME WITH HIGH-VOLUME AIR SAMPLER. *(Haiborgumu ea sanpura ni okeru tsuka kukiryo no keisoku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):594, Oct. 1973. (Presented at the Japan Soc. of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 315.)*

The accuracy of particulate concentration in air depends entirely on the measurements of the weight of particles collected on filter paper and the air volume sampled. The errors of the measurements are usually not negligible. The errors are caused mainly by changes of voltage and filter paper resistance and by characteristic change of blowers, in addition to reading errors. The effects of the changes of voltage and filter paper resistance were studied using a flow gauge and an orifice with an integrating meter. A change of 10 volt in input voltage resulted in a change of 9.8 cu m/hr in flow rate when the flow gauge was used. Measurements of flow rates by a standard flowmeter and by the above two methods revealed that the type of method used in the operation was important in terms of accuracy.

39484 **APTIC NO. 62622**

Nelson, A. W.

DETAILED EXHAUST EMISSION MEASUREMENTS OF THREE DIFFERENT TURBOFAN ENGINE DESIGNS. *North Atlantic Treaty Organization, Neuilly sur Seine*

(France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. -1-4-13. 4 refs. (April 9-13.)

NTIS, DDC: AD-769 278

A series of test programs was conducted to better define the exhaust emission characteristics of three different Pratt and Whitney Aircraft engine models: the JT3D, a low bypass ratio turbofan engine; the JT8D, a mixed flow turbofan engine; and the JT9D, a high bypass ratio turbofan engine. Three different methods were used to evaluate the emission levels of each engine model: multipoint rake, exhaust case pressure probes, and super-detailed traversing. Analysis of the latter method produced highly refined contour plots of carbon monoxide, total hydrocarbons, and nitrogen oxides emissions footprints as well as exhaust temperature and pressure variations of the plane of the ailpipe. The levels of CO and NOx are significantly affected by changes in both inlet temperature and humidity, while the hydrocarbons was affected only by humidity. (Author abstract modified)

39485 APTIC NO. 62017

Nishida, Konosuke, Tsuneo Honda, Kazuhiko Mitsuoka, and Masanobu Yamakawa

THE DETECTION OF ODOR SUBSTANCES IN FISH SKIN FROM OIL-POLLUTED SEA. *(Ishugyo no shuki seibun no kenchi hoho ni tsuite). Text in Japanese. Akusho No Kenkyu (Odor Research J. Japan), 2(10):1-15, 1973. 18 refs.*

Some of the fish captured in the Mizushima area of the Inland Sea are polluted by factory effluents. Because the odor is detectable only after cooking, a method of detecting odor elements at the stage of capturing fish is very much desired. The odors emitted from the fish skin are not directly applicable to gas chromatography and require a method of trapping and concentration. Trapping the odors from the fish skin and analyzing them after evaporation and gasification in helium was effective. When using a flame photometric detector, the emission elements from polluted and unpolluted fish show no analytical elements. A flame ionization detector shows four kinds of elements that are not detected on unpolluted fish; toluene especially shows the clearest peak in gas chromatogram. Therefore, a method of applying non- dispersive infrared analyzer to the emission from the entire cover of a truck load before shipment was recommended.

39486 APTIC NO. 62018

Nishida, Konosuke, Tsuneo Honda, and Tadao Ando

ODOR TESTER (III). *(Shukido sokutei sochi ni tsuite). Text in Japanese. Akusho No Kenkyu (Odor Research J. Japan), 2(10):1-14, 1973. 20 refs.*

The government odor control law designates only five odor-producing elements as the basis of emission and concentration regulations. In reality most odors are complex compositions of more than five elements. Therefore, a suggestion is made for the preparation of an index chart of various odor producing elements singly and in combination, under various temperatures, humidities, and concentration conditions. Sampling bags of various materials used by various scientists are reviewd, and physical properties of plastic films such as Mylar, Aluminized Mylar, Saran Wrap, Saran Wrap Drumliner, Scotch Pak, and Aluminized Scotch Pak are compared. Sampling gas preservation time for various gases in a plastic bag, and the gas concentration changes with time are reviewed. Plastic flexible bags are very effective as gas sampling bags. Polyester films and aluminized polyester films are most suitable. When analyzing traceable odor elements in the air, the low temperature concentration trap method makes it possible to repeat analysis using the same sample material trapped in a plastic bag.

39487 APTIC NO. 62128

Oshima, Shozo, Yasuo Iwamiya, Chutaro Machida, and Yuji Takagi

GAS CHROMATOGRAPHY ANALYSIS OF HYDROCARBONS IN AUTOMOTIVE EXHAUST GASES. *(Jidosha haishutsu gasuchu no tanka suiso no gasu kuromato gurafu bunseki). Text in Japanese. Maruzen Sekiyu Giho (Maruzen Oil Tech. Rept.), no. 18:57-62, 1973. 10 refs.*

Exhaust gases from a domestic, 2000 cc, 4-cycle, gasoline engine were sampled with a pretreatment tube consisting of a calcium chloride section heated at 100 C and a soda lime section. They were collected in a concentration tube packed with 200 mm of Polapack S (60/80) and 100 mm of chromosorb W(60/80) impregnated with 15 wt% of silicon grease (SE-30). The concentration tube was immersed in a dry ice-methanol bath. The concentration tube was then heated at 100 C and the gases were introduced into two columns, one packed with 80/100 polapack S(2 m) and the other Squalane (45 m), and the column temperature was increased gradually from -60 C to 120 C. Helium was used as a carrier and the components separated in both columns were analyzed with flame ionization detectors. More than 97% of hydrocarbons in a standard gas sample were recovered. The first column separated C1 to C5 and C1 to C10 satisfactorily.

39488 APTIC NO. 62184

Pustinger, John V., David A. Shaw, Paul L. Sherman, and Arthur D. Snyder

INSTRUMENTATION FOR MONITORING SPECIFIC PAPTICULATE SUBSTANCES IN STATIONARY SOURCE EMISSION. (FINAL REPORT). *Monsanto Research Corp., Dayton, Ohio, Environmental Protection Agency Contract 68-02-0316, Program Element 1AA010, EPA-R2-73-252, Rept. MRC-DA-350, 426p., Sept. 1973. 508 refs.*

NTIS: PB 232088/As

Instrumentation for measuring metal particulates in stationary source emissions is described. A prototype analytical and sampling system capable of continuously monitoring the concentration of beryllium and cadmium in typical stationary source emissions was developed. Technology appropriate to the analytical determination of beryllium, cadmium, arsenic, antimony, barium, boron, chromium, copper, lead, manganese, mercury, nickel, and vanadium in stationary source emissions is identified. Radio-frequency induced emission spectroscopy and AC arc-induced emission spectroscopy were chosen for application studies as continuous monitoring techniques for Be and Cd. A feasibility study of the radio-frequency induced plasma system indicated that the system could not be applied to continuously flowing sample gases containing air, even though a detection limit of 0.4 micrograms Cd/cu m was obtained in an argon matrix. The arc- induced emission spectroscopy is potentially useful for continuous monitoring of any metal by employing a monochrometer to select specific atomic emission lines of the various metals. It can detect Be at the 1 microgram/cu m level. The corresponding sensitivity for Cd was very poor, and time did not permit optimization of the continuous monitor for Cd detection. Difficulties were encountered during field tests at a coal-fired power plant; however, emission spectroscopy is the most promising approach to trace metal monitoring in work environments and stationary source effluents. (Author abstract modified)

39489 APTIC NO. 61924

Saeki, M.

ON THE STANDARD AND CONTINUOUS ANALYSIS OF NITROGEN OXIDES IN THE EXHAUSTS. *(Haigasu chuno chisso sankabutsu no hyojun bunsekiho oyobi renzoku bunsekiho no kento). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 35-51, 1973. 4 refs. (Presented at* *the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

The problems arising from on-site analysis of nitrogen oxides are discussed and various analytical methods are compared. The naphthyl ethylene diamine method (NEDA) is recommended in the Japan Industrial Standards, but is not recommended as the standard method. Tentatively, JIS recommends the phenoldisulfonic acid (PDS) method as the standard method, the rapid PDS method as a simple and rapid test, the zinc reduction-NEDA method as a simple and accurate test, and the Saltzman method for nitrogen dioxide analysis. Factors causing errors in the PDS and Zn-NEDA methods are enumerated and evaluated. Carbon dioxide and carbon monoxide do not influence the PDS determination, and in the Zn-NEDA method, sulfur dioxide does not influence the nitric oxide value until it exceeds 0.2%. Optimum oxidation, neutralization, evaporation, and reduction conditions and agents were evaluated for the Zn-NEDA methods. Precision of analysis was 4.5% for PDS, 5.2% for Zn-NEDA, and 4.2% for continuous analysis. The effect of gas components on the continuous analysis of NOx was examined for chemiluminescent, infrared, ultraviolet, oxidative, and reductive methods.

39490 **APTIC NO. 61919**

Sakai, K.

NEW AUTOMATIC CONTINUOUS ANALYTICAL APPARATUS FOR NITROGEN OXIDES. *(Chisso sankabutsu no atarashii jido buseki kiki ni tsuite). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 137-164, 1973. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

The newly developed technique of ultraviolet absorption spectroscopic analysis is described. A double beam system is designed to measure nitrogen oxides content in exhaust by making use of the reaction of ozone, in which a mixture of nitric oxide and nitrogen dioxide is oxidized to nitric anhydride by the reaction with O3 and subsequently N2O5 decomposes to NO2 at 250- 400 C. A conversion efficiency of 99.5% or higher can be obtained. It was found that the simultaneous presence of sulfur dioxide, carbon dioxide, and water seldom affects the measurement and that the influence of NH3 is also negligible when NH3 is less than 100 ppm. A correlation spectroscopic method can measure several components simultaneously. This method makes a simultaneous measurement of NO, SO2 and NO2 possible by making use of absorptions at 195-230 nm for NO, 280-310 nm for SO2, and 420- 450 nm for NO2. The new correlation spectroscopic method is designed to remove the effect of SO2 and NO2 on the measurement of NO. The field test of the above two methods showed excellent results compared with chemical analysis data (phenol-disulfonic acid method).

39491 **APTIC NO. 61896**

Sekiuchi Teruo, Kaku Kikuchi, and Hikaru Sone

DETERMINATION OF FLUORIDE IN BIOLOGICAL SAMPLES BY NONFUSION DISTILLATION AND ION SELECTIVE MEMBRANE ELECTRODE METHOD. *(Shokubutsu taichu fusso no jinsoku bunsekiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):266, Oct. 1973. 1 ref. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 2.)*

To quickly measure the fluoride pollution from a fertilizer plant and a tile manufacturing plant which is absorbed from the air into plants, a nonfusion distillation method was used. The F content in plant leaves was determined and the values were compared with those of Association of Official Agricultural Chemists method and the ion-electrode method. The test material was ashed, perchloric acid and silver perchlorate were added, and reflux analysis was done at 140 C. The ashes were distilled and the extract was measured by colorimetry. The best recovery rate was obtained with the reflux time of 3 hr. By this method, the recovery rate was 93.8%, by the AOAC method about 90%, and the measurements were approximately the same. When using ion selective membrane electrode method, the results were similar to the colorimetry values. The nonfusion distillation method proved to be simple and accurate.

39492 **APTIC NO. 62203**

Sem, Gilmore J. and John A. Borgos

STATE OF THE ART: 1971 INSTRUMENTATION FOR MEASUREMENT OF PARTICULATE EMISSIONS FROM COMBUSTION SOURCES. VOLUME IV: EXPERIMENTS AND FINAL REPORT. *Thermo-Systems, Inc., St. Paul, Minn., Environmental Protection Agency Contract CPA 70-23, Program Element 1AA010, EPA-650/2-73-022, 120p., Sept. 1973. 40 refs.*

NTIS: PB-231 919/AS

The last phase of a 1971 state of the art survey of instrumentation for measurement of particulate emissions from combustion sources is presented and includes experiments and a final report. Various approaches for automatic, continuous measurement of the rate of particulate mass emissions from smoke stacks on large coal and oil combustion facilities are discussed. Early laboratory tests performed with the sensing head of a Gelman beta radiation instrument are described. The tests resulted in a set of calibration curves, each curve representing a different initial clean filter thickness. A sampling facility is described which was designed specifically for the evaluation of the instruments which measure particle mass concentration of stack effluents. It was designed, constructed, evaluated, and operated on a section of breeching of a coal-fired power plant. Sampling facilities were calibrated in the field experiment station under several normal operating conditions with identical high efficiency filters in both parallel sampling lines. Test results are presented of two prototype instruments with beta radiation particle mass sensors and with filter collectors which were tested for a short time in the stack facility. Both were developed for auto exhaust particle measurements. Candid comments regarding commercial transmissometers are presented and recommendations on the design, installation, and operation are included. (Author abstract modified)

39493 **APTIC NO. 62358**

Shigeta, Yoshihiro, Tomohiko Ishiguro, Takashi Hasegawa, Yoshio Nagata, and Noribuni Takeuchi

STUDY ON SAMPLING OF ODOROUS SUBSTANCES. FIRST REPORT: STABILITY OF TRIMETHYLAMINE AND SULFUR COMPOUNDS IN SAMPLE CONTAINERS. *(Akushu busshitsu no saishu hoho ni kansuru kenkyu - dai ippon, torimechiruamin to iwo kagobutsu no saishu yoki ni okeru anteisei). Text in Japanese. Preprint, Japan Environmental Sanitation Center, Kawasaki, p. 82-83, 1973. (Presented at the National Meeting on Environmental Sanitation, 17th, Nagoya, Japan, 1973, Paper 5.)*

Stability of odorous substances in various sample containers was studied. The 300 ppm trimethylamine standard gas was comparatively stable in a polypropylene bag, which indicated an 80% preservation rate 20 hr later. Syringe type sample containers invariably gave poor stability of the sample contained therein, and the preservation rate was less than 50% when measured 20 hr later. The syringe with its inner and outer tubes sealed to prevent leakage between the tubes gave the best result. Using the 1.3 ppm hydrogen sulfide standard gas (with nitrogen as the balance gas), a similar test was performed with a polypropylene bag and several syringe-type samplers. While the preservation rate measured 20 hr later was

72% with the polypropylene bag, it was practically unmeasurable or undetectable with the syringy type samplers. A hard glass container treated with hydrochloric acid and another hard glass syringe which was untreated were filled with dry air as the balance gas and then with 500 ppb sulfur compounds (such as hydrogen sulfide, methyl mercaptan, ethyl mercaptan, and others). The former container gives better results with 70% or higher preservation rate 65 hr later. As the balance gas, nitrogen was better than air. In another stability test, using a phosphoric acid-treated glass container, a plastic bag, and an aluminum bag, the first two were suitable for sampling a mixed gas (composed of hydrogen sulfide, methyl mercaptan, dimethyl sulfide) with an 80% preservation rate 20 hr later.

39494 **APTIC NO. 62693**

Sibbett, D. J. and R. C. Wade

DEVELOPMENT OF INSTRUMENTATION FOR QUANTITATIVE COLLECTION OF TOTAL ATMOSPHERIC MERCURY FROM AMBIENT AIR (FINAL TECHNICAL PROGRESS REPORT). *GEOMET Inc., Pomona, Calif., Office of Experimental Development, Environmental Protection Agency Contract 68-02-0578, Rept. EPA-650/2-73-052, LF-215, 6, 140p., Aug. 1973. 7 refs.*

NTIS: PB 232300/AS

A prototype device for the quantitative collection of airborne mercury in particulate, elemental, and combined forms, respectively, was designed, fabricated, and tested. The device utilizes a Hi-Vol Sampler into which two canisters containing absorbers for elemental and combined Hg were added in a collection plenum below the glass fiber filter. The plenum was located between the funnel shaped inlet duct of the Hi-Vol Sampler and the flower motor. It supports th two collection canisters and controls the air flow through the series arrangement. Of the total air (20+ CFM), about 1/5 passes through the canisters. The absorbents were performance tested in 24 hr runs at challenge levels from ambient to 119 micrograms/cu m. In addition: tests were carried out in the presence of gaseous pollutants: hydrogen sulfide, sulfur dioxide, chlorophenol, nitric oxide, and xylene. None of the pollutants modified the quantitative collection performance of the absorbents. An analytical procedure for each of the three separately collected forms of Hg has been developed and tested. (Author summary modified)

39495 **APTIC NO. 62666**

Tsang, Peter

DEVICE FOR COLLECTION AND ASSAY OF AMBIENT GASES. *Bendix Research Labs., Southfield, Mich., Environmental Protection Agency Contract 68-02-0657, Proj. Element 1AA010, Rept. EPA-650/2-74- 006, 111p., Dec. 1973.*

NTIS: PB 231364/AS

A report is presented on the development and testing of a solid-state collection device and transfer interface device for the sampling and assay of nitrogen oxides. Topics covered include: the collector system design, identification and characterization of solid chemical absorbents, evaluation of candidate absorbents, interference studies, and recommendations. The device allows for selective collection of NOx with a tandem arrangement of two absorbent cartridges: The first, containing triethanolamine hydrochloride packing, completely absorbs nitrogen dioxide from the air sample without affecting the nitric oxide concentration; while the second, filled with cobalt oxide packing, quantitatively removes NO. The collected oxides are later eluted and analyzed separately. Appendices are provided for typical recordings of collector materials and directions for assembling the collector field housing.

39496 **APTIC NO. 62606**

Tsuji, Kusuo, Yasuo Suzuki, Masuo Tobe, Yasuko Emoto, Takashi Osaka, Masao Kakizaki, and Manabu Muramatsu

RELATIONSHIP AMONG THE CONCENTRATION OF PARTICULATES IN ATMOSPHERE BY HIGH VOLUME AND LOW VOLUME AIR SAMPLER, AND METALS COMPONENTS ON GLASS FIBER FILTERS. *(Ea sanpura ni yoru fuyu funjin nodo narabi ni gurasu faibasei roshichu no kinzoku seibun ni tsuite). Text in Japanese. (Eisei Shikensho Hokoku Bull. Natl. Inst. Hyg. Sci. (Tokyo), no. 91:66-68, 1973. 4 refs.*

Concentrations of atmospheric suspended particulates collected with high and low volume air samplers were compared, and metal components on glass fiber filters were analyzed. Values obtained from both samplers were related by the following expression: Y equals 2.026X plus 0.0583, where Y is the weight of particulate by high volume sampling and X is the weight of particulate by low volume sampling. Five pieces of similar quality glass fiber filters offered by different manufacturers for analysis of metal components revealed calcium, magnesium, iron, and zinc as the main components.

39497 **APTIC NO. 61934**

Watanabe, Hiroshi, Motohiro Takada, Hiroshi Kosaka, and Masatoshi Nakamura

ON MEASUREMENT OF PARTICLE SIZE DISTRIBUTION OF AEROSOL IN AIR. *(Taikichu earozoru no ryudo bunpu sokutei ni tsuite). Text in Japanese. Preprint, Japan Environmental Sanitation Center Kawasaki, p. 79-80, 1973. (Presented at the National Meeting on Environmental Sanitation, 17th, Nagoya, Japan, Oct. 18-19, 1973, Paper 3.)*

Particle size distribution of atmospheric aerosols was analyzed by means of various sampler/analyzers which could be classified into two categories, one analyzing the aerosol particles to classify them into particles of 10 micron or greater and those smaller than 10 micron, and the other classifying them into various grades of particle size. The sampler/analyzers of the first category included the sampler equipped with a horizontal elutriator type multi-stage grading device making use of gravitational sedimentation of particles, and the low-volume sampler equipped with a cyclone device. The values obtained by these two sampler/ analyzers show a high correlation to each other. A similar comparison was made between the standard high-volme sampler and the sampler with a multi-stage grading device to find their correlation. The results obtained by these measurements indicate that the particles smaller than 10 micron account for about 60% of the total aerosol particles. The three different samplers of the second category used were the high-volume type Andersen sampler, the Andersen sampler, and the cascade centripetal sampler. The proportion of the particles smaller than 10 micron amounted to 72-80% as measured by the high-volme type Andersen sampler, about 90% by the Andersen sampler, and 80-85% by the cascade centripetal sampler, indicating inconsistency among them. The average particle size also varied with the type of the sampler used. Compared with the standard high-volume sampler, they tended to give lower values. This may be most probably due to adhesion of the particles to the inner walls of the samplers.

39498 **APTIC NO. 62013**

Williams, D., J. Driscoll, C. Curtin, and R. Hebert

METHODS FOR THE RAPID AND ACCURATE MEASUREMENT OF NITRATE AND SULFATE IN ATMOSPHERIC PARTICULATES. *Abcor Inc., Cambridge, Mass., Walden Research Div. Environmental Protection Agency Contract 68-02-0564, Program Element 1AA010, EPA-650/2-73-050, 103p., Dec. 1973. 13 refs.*

NTIS: PB-230 887/AS

Methods for the rapid and accurate determination of nitrate and sulfate in atmospheric particulate samples were developed and compared to current spectrophotometric methods. An Orian nitrate electrode was used to measure nitrate leached from 10 48 sq cm-strips of filters. The strips were analyzed by the electrode, Sawicki and Scaringelli, and phenoldisulfonic acid (PDS) methods. One sample was outside the range of the Sawicki method, one sample gave an electrode value which was 70% high. A good correlation was found with both methods for the remaining samples (r equals 0.986 and 0.945). The slopes of the regression lines were 1.0 + or - 10%. Standard deviations between the methods were 13% for electrode-Sawicki and 22% for electrode- PDS. Nine filter sections were analyzed for sulfate by the electrode and barium chloranilate procedures. The methods agreed for seven of the samples for sulfate from 0.65 to 0.225 mg. The percent standard deviation was 10%. The nitrate method is the most direct method, but because of the logarithmic electrode response, precision is achieved with some difficulty (4%/mv). The sulfate method measures soluble sulfate only and is procedurally more difficult than the nitrate method. The precision of the sulfate procedure can be improved by using more lead standards. (Author summary modified)

39499 **APTIC NO. 61614**

Yamamoto, Katsura

GAS SENSING ELEMENT. *(Gasspuerelement). Text in German. (Nittan Co. Ltd., Tokyo (Japan)) W. Ger. Pat. Appl. 2,240,814. 4p., March 8, 1973. (4 claims).*

A non-heated gas sensing element with high sensitivity, even for inorganic gases, is described. The gas sensing element is composed of activated carbon, preferably in the form of thin film on an insulating support such as ceramic, glass, or synthetic resin. The sensing element is provided with a pair of electrodes. The sensing element detects gases by changing its electric conductivity due to its adsorption of the gas to be detected. When incorporated in an instrument, the element generates a signal by a circuit arrangement whenever its conductivity changes, and emits an alarm signal.

39500 **APTIC NO. 61892**

Yatabe, T.

STUDY ON THE METHODS FOR THE CONTINUOUS DETERMINATION OF NITROGEN OXIDES IN FLUE GAS. *(Hai-gasu-chu no chissosankabutsu no renzoku sokuteiho ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan. Air Cleaning Assoc., Tokyo), 11(6):17-25, Dec. 1973.*

A general discussion is given for the continuous determination of nitrogen oxides by chemiluminescence, non-dispersive infrared, dispersive ultraviolet, non-dispersive ultraviolet, coulometry and electrochemical transducer methods. The ideal range of wavelength measurement for chemiluminescence method is 600 to 900 nm, which is accomplished usually by using a filter to eliminate the chemiluminescence of ethylene and ozone at 400 to 430 nm; this method gives linear calibration curve for a wide range of nitrogen dioxide concentration; it is also generally considered as free of the interference of carbon monoxide and sulfur dioxide. Non-dispersive IR can be used to determine up to 20 ppm of nitric oxide which shows absorption at 5.3 micron; the interference of water vapor or carbon dioxide can easily be eliminated by comparing with standard gas sample. The UV spectrometer can be used to determine up to 1% of NO2 which shows absorption at 380 to 400 nm; at this range, the overlap of absorption caused by SO2 and CO is negligible so that the determination is not interfered with. The concentration of NO2 in flue gas can be determined by measuring the electrolytic current induced by the impressed voltage on the bromine molecule which is formed from the reaction of NO2 and bromide ion; SO2 of higher than 500 ppm interferes significantly. Therefore, it must be removed with hydrogen peroxide before the analysis is performed.

39501 **APTIC NO. 62367**

Yoshimoto, Kenji, Kazumi Koike, Ichiro Kojima, Yasuyuki Hoshika, and Kin Tsunowaki

AN EXAMPLE OF THE ODOR CHAMBER METHOD APPLIED TO THE INVESTIGATION OF ODOR NUISANCE. *(Akushu kogai chosa no tameno mushu-shitsu no oyo-rei). Text in Japanese. Preprint, Japan Environmental Sanitation Center, Kawasaki, p. 80-81, 1973. (Presented at the National Meeting on Environmental Sanitation, 17th, Nagoya, Japan, Oct. 18-19, 1973. 2 refs. Paper 4.)*

Olfactory perceptions of five representative odorous substances were examined by an odorimetry panel consisting of 115 people. The odor chamber had five apertures which were able to be used by up to five people at a time. The odorous substances tested were 5 ppm of ammonia prepared to give an odor intensity of 3.5, 0.002 ppm trimethylamine with an odor intensity of 3.0, 0.006 ppm hydrogen sulfide with an odor intensity of 3.0, 0.004 ppm methyl mercaptan with an intensity of 3.0, and 0.005 ppm dimethyl sulfide with an odor intensity of 3.0. The test was designed to measure how well the panel could remember individual odors, distinguish between different odors, recognize a mixture of odors, and describe the odor perceived. In the control chamber which contained nothing but pure air, most of the panel members stated that they smelled dust or rubber. Most were not able to give the name of an odorant unless they were told in advance, although they could perceive some type of odor. Hydrogen sulfide was remenbered most often, and ammonia was ofter described as an irritative. About 50% of the panel could distinguish one odor in a mixture, while only a few people could recognize two or more substances. Hydrogen sulfide and trimethylamine were the most often recognized.

39502 **APTIC NO. 61006**

SNIFFERS BENEATH THE STACHUS. *(Schnueffelsonden under dem Stachus). Sanit. Heizungstech., no. 5:440, 1973. Translated from German, 4p.*

A total of 115 carbon monoxide measurement systems (sniffers) were installed in the underground building complex of Munich s Karlsplatz, generally known as the Stachus. They are distributed over the garage sections and loading points. The stations can measure 0 to 300 ppm CO from automobile exhaust. If the lower threshold of 20 ppm is exceeded, a blower is switched on to remove some of the pollutants. Ir a threshold of 50 ppm is exceeded, a second blower starts. If the upper threshold of 200 ppm is exceeded, an alarm is triggered and a sign, Evacuate Garage, lights up. The results of the various measurements are sent to a central monitoring section.

39503 **APTIC NO. 61735**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO THE DETERMINATION OF FINE DUST CONCENTRATIONS. *(Bergweksverband G.m.b.H., Essen (Germany)) Brit. Pat. 1,328,075. 5p., Aug. 30, 1973. (Appl. Sept. 27, 1971, 14 claims).*

An apparatus and method for determining fine dust concentrations in the atmosphere are described. The intensity of light scattered by the fine dust particles is compared with the intensity of a comparison light beam. The measurements should reflect the probability of retention of the fine dust in the pulmonary alveoli, which is a function of the size of the dust particles. The apparatus consists of a source of light at a wave length in the range of 800 to 100 nm and a chamber for containing the atmosphere of which the fine dust concentration is to be measured. The chamber has a means for admitting a primary beam from the light source and an outlet window. There is an optical means including the outlet window which is arranged to transmit the comparison beam and a light beam by the fine dust at an angle in the range of 60-80 degrees from the direction of the primary beam. This apparatus makes use of the discovery that the stray light intensity on dispersion of light by fine dust, particularly of mined mineral coal, is largely independent of the material properties and that the functional dependence on the particle size of the fine dust can be altered by varying the scattering angle and the wave length range of the incident light.

39504 **APTIC NO. 61952**

Inventor not given

APPARATUS FOR MEASURING CARBON MONOXIDE AND TOTAL HYDROCARBONS IN GAS SAMPLE. *(Mine Safety Appliances Co., Pittsburgh, Pa.) Brit. Pat. 1,334,286. 4p., Oct. 17, 1973. (Appl. No. 30, 1971, 11 claims).*

An apparatus for simultaneously measuring the amount of carbon monoxide and total hydrocarbons in a gas sample is described. The apparatus has two hydrogen flame analyzers for measuring hydrocarbon quantities: a conduit for delivering part of the sample to the first analyzer and a second conduit for simultaneously delivering the rest of the sample to the second analyzer. There is a reactor in the second conduit for converting CO to methane, whereby the portion of the sample delivered by the second conduit will contain a greater amount of hydrocarbons than the part delivered by the first conduit.

39505 **APTIC NO. 61986**

OPTICAL SMOKE DENSITY METERS. *(Rauchdichtemessgeraete). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 53-54, 57, 61.*

The principle of optical smoke and dust density meters, as well as commercially available optical smoke density meters are described. Optical density meters measure the extinction of a beam passing through a gas flow containing dust or aerosol particles. The extinction is proportional to the aerosol or dust particle concentration in the gas. The extinction of the gas flow is compared to that of a reference. The smoke density meter model RM 4 by Erwin Sick Optik-Elektronik is designed for smoke density measurement in the flue gas ducts of large-capacity firing equipment, waste incinerator plants, and cement works. The model RM 61 is intended for use in small to medium size combustion equipment, and waste incinerators. Continuous recording of the dust concentrations through continuous comparison of the measuring beam extinction with a reference beam is possible by means of the dust measuring instrument model D-R 110 by DURAG-Apparatebau. The photoelectric pulses generated by the measuring and the reference beams are compared by a test motor.

39506 **APTIC NO. 61987**

THERMAL CONDUCTIVITY ANALYZERS. *(Waermeleitfaehigkeitsmessung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 12-13, 15-16, 26, 40, 46.*

The principle of thermal conductivity measurement in the determination of combustible gas and carbon dioxide concentrations, and commercially available thermal conductivity analyzers are described. Thermal conductivity analyzers exploit the differences in the thermal conductivity of different gases by using platinum wires with highly temperature-dependent electric conductivity for the test gas and for a reference gas, usually air, arranged in a Wheatstone bridge. The DRAEGER-Cerchar remote methane sensor by Draegerwerk AG, and natural gas and propane sensors by Auergesellschaft GmbH adopt the catalytic principle for a lower concentration range, and the thermal conductivity measurement for the higher concentrations. Siemens instruments designed for the determination of hydrogen concentrations or of carbon dioxide in flue gases are suitable also for the surveillance of explosion limits. A thermal conductivity analyzer by Georg C. K. Withof GmbH measures CO2 concentrations up to 100% in flue gases by burning off hydrogen and methane that may be present.

39507 **APTIC NO. 61988**

ON-LINE CHROMATOGRAPH WITH STORING INJECTION SYSTEM. *(Prozess-Chromatograph mit speichernder Dosierung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 45.*

On-line chromatography with storing injection system, developed by Siemens AG for the detection and quantitative determination of trace components in air, is described. The sample to be analyzed is led into a cooled column with solid adsorbent in which the sample is both stored and concentrated. The column is heated up and the sample is desorbed for the subsequent gas-chromatographic determination, e.g., by means of flame- ionization detector.

39508 **APTIC NO. 61989**

AUER BILLION AIRE GAS DETECTOR. *(Gasspurenmessanlage AUER BILLION AIRE). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 11-12, 19.*

The principle of aerosol ion current detectors, and instruments available for pollutant concentration measurement on this principle are described. It is possible to detect pollutant concentrations as low as 0.0000001% by volume by converting them into aerosol by pyrolysis, chemical reaction, or their combination. The aerosol thus obtained causes sharp reduction in the ionization current in ionization chambers using a radioactive ionization source such as americium. The AUER BILLION AIRE ionization current detector by Auergesellschaft GmbH adopts salt fog formation, pyrolysis, or UV irradiation for aerosol generation for the measurement of such pollutants as ammonia, aniline, arsine, tetraethyl lead, hydrocyanic acid, diborane, halogens, halogenated hydrocarbons, hydrazine, iron and nickel carbonyls, phosgene, and nitrogen dioxide. Both individual components, such as phosgene, hydrocyanic acid, and nickel carbonyl, and classes of components, such as halogens, and amines can be measured in the lower ppm range.

39509 **APTIC NO. 61990**

FLAME-IONIZATION DETECTORS. *(Ionisationsstrommessung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 11-12, 20, 32, 40.*

The principle of flame-ionization detectors (FID), and commercially available FIDs for total hydrocarbon concentration measurement are described. The charge density of the ion cloud around and within the hydrogen flame, and consequently the current between the two electrodes is a function of the hydrocarbon or carbon atom concentration. For the determination of individual hydrocarbons, preliminary separation by gas chromatography is necessary. The Pollumeter Model 1273 by Beckman Instruments GmbH uses hydrocarbon-selective FID for total hydrocarbon concentration measurement in the ranges of 0-20 ppm and 0-200 ppm methane. The Fidas 2 T flame-ionization detector by Hartmann and Braun AG is suitable for the continuous measurement of hydrocarbon concentrations up to 1000 ppm, and can be integrated in computer-controlled, automatic monitoring networks. The Fidamat instrument by Siemens AG measures hydrocarbon concentrations up to 10,000 ppm.

39510 **APTIC NO. 61991**

COULOMETRIC ANALYZERS. *(Coulometrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 11, 39.*

The principle of the coulometric measurement of low concentrations of gaseous pollutants, and a commercially available coulometric analyzer are described. Coulometric analyzers adopt the principle of coulometric titration, in which the quantity of the reagent (bromine for oxidizable sulfur compounds) that is necessary for titration is produced by electrodes, during which the current necessary for producing the reagent is a function of the test gas concentration. The PW 9700 model sulfur dioxide measuring instrument by Philips Elektronik Industrie GmbH, suitable for the measurement of SO2 concentrations in a range of 0.3-10 mg/cu m, and with a sensitivity of 10 microgram/cu m, can be integrated in automatic air pollution monitoring networks.

39511 **APTIC NO. 61992**

GALVANIC ANALYZERS. *(Coulometrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 11, 31.*

The principle of the galvanometric measurement of gaseous pollutant concentrations, and a commercially available galvanometric analyzer are described. Galvanometric instruments, measuring gas concentrations by the induction of electric current in the measuring electrode as a function of concentration due to electrochemical reactions between the test gas and the reagents in the electrode, are suitable for the detection of very small concentrations in the ppb range. A stationary or portable Picos galvanometric instrument by Hartmann and Braun AG for air pollution monitoring, equipped with a solid organic electrolyte, is suitable for the measurement of nitrogen dioxide, nitric oxide + NO2, total nitrogen oxide, hydrogen sulfide, phosgene, and possibly chlorine concentrations in the respective lowest and highest measuring ranges of 0-50 ppb and 0-2 ppm.

39512 **APTIC NO. 61993**

COLORIMETRIC ANALYZERS. *(Kolorimetrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 9-11, 21, 37.*

The principle of the colorimetric analysis of gaseous pollutants, and commercially available colorimetric analyzers are described. The gas to be analyzed is contacted with a reagent solution for a certain time so that averaged concentration values are obtained. Colorimetric measurement is also possible by photoelectric comparison of color spots obtained on a reagent-soaked ribbon with a standard color. The Braun and Luebbe B and L-Imcometer is suitable for the measurement of the 30-min-concentrations of sulfur dioxide, nitrogen oxides, and oxidants by modified West-Gaeke and Saltzman methods. The measuring ranges are 0-0.25 ppm and 0-1.4 ppm for SO2, 0-0.2 ppm and 0-0.55 ppm for nitrogen dioxide, and 0-0.15 ppm and 0-0.3 ppm for chlorine. The MONOCOLOR colorimetric gas trace analyzer by Maihak uses reagent-soaked paper ribbon for the measurement of hydrogen sulfide, hydrofluoric acid, hydrochloric acid, phosgene and toxic gases in a concentration range of 0-0.2 ppm. The concentration is determined by measuring the difference in the brightness of the colored spot and of a non-exposed standard.

39513 **APTIC NO. 61994**

CONDUCTOMETRIC ANALYZERS. *(Konduktometrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 9-11, 30, 48-49.*

The principle of the conductometric analysis of gaseous air pollutants in air, as well as commercially available conductometric analyzers for such purposes are described. Conductometric analysis, using usually slightly acidified water with hydrogen peroxide as reagent solution, measures the gas concentration as a function of the change in conductivity caused by the test gas in the absorbent solution. Conductometric analyzers are usually thermostatized to exclude temperature-dependent variations in the conductivity. The ULTRAGAS-U3S and U3E conductometric analyzers by H. Woesthoff oHG are suitable for the continuous recording measurement of sulfur dioxide, hydrogen sulfide, carbon dioxide, ammonia, and possibly chlorine concentrations. Two measuring ranges of 0-1/2.5/5 mg/cu m and 0-0.4/1/2 mg/cu m are available for SO2. The stationary or portable Picoflux 2 T trace analyzer, developed by Hartmann and Braun AG for SO2 monitoring in the respective ranges of 0-1 mg/cu m and 0-5 mg/cu m, is also suitable for the determination of small concentrations of hydrochloric acid and ammonia. The MICROGAS-MSK-SO2 analyzer by Woesthoff oHG is suitable for SO2 determination in a concentration range of 0-5 g/cu m in flue gases.

39514 **APTIC NO. 61995**

POTENTIOMETRIC ANALYZERS. *(Potentiometrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 9-11, 21.*

The principle of the potentiometric measurement of gaseous air pollutant concentrations, and commercially available potentiometric analyzers are described. The B and L-Sensimeter by Braun and Luebbe, developed for hydrochloric acid and hydrofluoric acid emission concentration measurement in the respective ranges of 20-2000 mg/N cu m and 0.2-20 mg/N cu m, uses buffer solution for the absorption of the test gas, and thermostatized measuring cell with ion-sensitive electrodes.

39515 **APTIC NO. 61996**

IR PHOTOMETERS. *(Infrarotfotometer). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 8-9, 19, 27, 35-36, 41-42.*

Commercially available IR photometers are described. AUER LIRA model 202 and 303 IR analyzers by Auergesellschaft GmbH, adopting the non-dispersive IR absorption measurement principle, are suitable for the measurement of carbon monoxide in a range of 0-100 ppm, of carbon dioxide in a range of 0.-100 ppm, of ammonia in a range of 0-2000 ppm, of sulfur dioxide in a range of 0-2000 ppm, of ethylene concentrations ranging from 0 to 5000 ppm, and of solvent concentrations. The stationary or portable URAS T IR gas analyzer by Hartmann and Braun is suitable for the measurement of high and low concentrations of CO, CO2, SO2, nitric oxide, hydrocarbons, and solvent vapors. The twin-chamber, single-beam non-dispersive UNOR IR gas analyzer by Maihak measures CO, CO2, methane, acetylene, SO2, NO, ammonia, carbon disulfide, carbon tetrachloride, as well as other gases and vapors with high molecular weights. The two-beam ULTRAMAT IR analyzers by Siemens are designed for the measurement of CO, CO2, methane, hexane, and SO2 concentrations up to 1% concentration. Another analyzer by Siemens releases an alarm as soon as a threshold concentration of toxic and explosive gases, such as CO, CO2, methane, or hexane is exceeded.

39516 **APTIC NO. 61997**

ELEMENTAL ANALYSIS OF AEROSOLS AND DUST. *(Die Elementanalyse von Aerosolen und Staeuben). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 54-55, 62-64.*

The principle of x-ray spectrometry in the elemental analysis of aerosols and dusts, and commercially available x-ray spectrometers and x-ray diffractometers are described. X-ray fluorescence analysis is suitable for the qualitative and quantitative determination of solid, liquid, and gaseous substances in general, and of sulfur, arsenic, cadmium, mercury, and lead in air in particular, at a sensitivity of below 0.1 microgram/cu m. Identification and determination of dusts, such as of silicon and asbestos in air, is possible using x-ray diffraction analysis. The SRS Sequential X-ray Spectrometer by Siemens AG is a high-precision, automatic instrument for 24 different test programs with 20, 40, or 80 spectral lines of various combinations. The spectrometer is compatible with computers for automatic testing. Another Compact x-ray diffractometer by Siemens AG is composed of an x-ray tube, a scintillation counter, and a precision diffractometer for automatic or semiautomatic operation. Another energy-dispersive x-ray analyzer with silicon (lithium) semiconductor detector is used for x-ray diffractometric and x-ray fluorescence analyses alike. The MRS 3 model multi-channel x-ray Spectrometer by Siemens AG is suitable for the rapid, simultaneous identification and quantitative analysis of up to 17 elements beyond oxygen in concentrations from the ppm range to 100%.

39517 **APTIC NO. 61998**

CATALYTIC COMBUSTION ANALYZERS. *(Waermetoenungsmessung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 13, 15-18, 22-26.*

The principle of measuring combustible gas and vapor concentrations by catalytic combustion, and commercially available catalytic combustion analyzers for the detection and determination of combustible gases and vapors in the air are described. The concentration is determined from the change in the electric conductivity of the catalyst (usually Hopcalite for carbon monoxide) produced by the thermal effect of the catalytically burned components. Instruments developed by Auergesellschaft GmbH for the detection of methane and propane, as well as the methane remote sensing DRAEGER-Cerchar by Draegerwerk AG adopt the catalytic principle for the detection of low concentrations, and the thermal conductivity principle for the determination of high concentrations. The Ex-meter T2 by Auergesellschaft GmbH is suitable for the surveillance of explosion limits, as leak detector for pipelines conveying combustible gases, and generally for the determination of combustible gases and vapors. Other instruments by the same company measure combustible gas and carbon monoxide concentrations, and release alarms as soon as critical thresholds are exceeded. A small-size portable methane detector by the same company measures methane concentrations in a range of 0-3%. The AM 1 model CO monitor by Draegerwerk AG measures CO concentrations in the respective ranges of 0-150 ppm, 0-300 ppm, and 0-600 ppm.

39518 **APTIC NO. 61999**

PHOTOMETRY. *(Fotometrie). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 5-6, 21, 29, 47.*

The general principle of single-beam and two-beam photometers is described, and photometers commercially available for the measurement of air pollutant concentrations are presented. Photometers measure pollutant gas concentration by supplying electric signals proportional to the measure of the light attenuation by the gas tested. The B and L Uvameter by the Braun and Luebbe Company is suitable for the measurement of high concentrations of sulfur dioxide, nitrogen oxides, and chlorine by light absorption measurement in the UV range continuously. The universal two-beam Limas photometer by Hartmann and Braun KG, used primarily for the routine determination of nitrogen dioxide in automobile exhaust gases, can be optionally used as a photometer with selective modulation or as a photometer with monochromatic differential measurement. The Okometer 603 by the Georg C. K. Withof GmbH is suitable for the continuous measurement of gas concentrations in the 200-1000 nm range either in single-beam or in double-beam operation.

39519 **APTIC NO. 62001**

BACKSCATTERING PHOTOMETERS. *(Streulichtmessung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 9.*

The principle of backscattering measurement by laser technique for the remote investigation of aerosols and gases is presented. Light scattering by the gaseous or particulate pollutants is exploited for their measurement. The distance and the particle density of aerosol clouds and smoke plumes can be determined from the travel time and the intensity of the backscattered laser. Both qualitative and quantitative analysis of gaseous pollutants is possible by evaluating the Raman or fluorescence spectrum of the backscattered light.

39520 **APTIC NO. 62002**

UNOR NDIR SINGLE-BEAM GAS ANALYZER. *(UNOR nichtdispersiver Infrarot-Einstrahl-Gasanalysator). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 35-36.*

The UNOR NDIR single-beam gas analyzer, developed by H. Maihak AG for the measurement of carbon monoxide, carbon dioxide, methane, acetylene, ethylene, sulfur dioxide, nitric oxide, ammonia, carbon disulfide, and carbon tetrachloride concentration in the respective ranges of 0-10 ppm and 0-100%, is described. The gas analyzer is sensibilized selectively for a given test gas, and has two series absorption spaces connected through a membrane capacitor as a signal detector. Pressure pulses are generated according to the modulation which in turn evokes capacity changes in the membrane capacitor.

39521 **APTIC NO. 62003**

AIR TESTING VANS AND MONITORING NETWORKS. (Messwagen und Messnetze). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 34.

Air monitoring network composed of standardized modular units, and air testing van, both developed by Hartmann und Braun AG, are described. The air monitoring network and the air testing van contain computer-compatible instrument units that are interchangeable and require minimum maintenance. The air testing van contains instruments for the measurement of sulfur dioxide concentrations from 0 to 1 mg/cu m or from 0 to 5 mg/cu m; of hydrogen sulfide concentrations in a range of 0-0.5 mg/cu m; of nitrogen dioxide concentrations from 0 to 3 mg/cu m; of the total nitrogen oxide concentration from 0 to 0.5 mg/cu m; of carbon monoxide concentrations in a range of 0-25 ppm; of hydrocarbon concentrations from 0 to 10 ppm, and of dust concentrations up to 3 mg/cu m. The air testing van is also equipped with instruments for the measurement of such meteorological parameters as temperature, relative humidity, wind speed, and wind direction.

39522 **APTIC NO. 62004**

LASER-LIDAR TELE-FUMOSENS. *(Laser-Lidar Tele-Fumosens). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 60.*

The stationary or mobile Laser-Lidar Tele-Famosens system, developed by Impulsphysik GmbH for the detection and localization of particulate, aerosol, or gaseous pollution, and of inversion layers, is described. The system includes Cassegrain s optic system, polarizer, filter, photomultiplier, and oscillograph. The measuring distance amounts to 10 km during daytime, and more during nighttime. Another system for quantitative remote measurement of gaseous pollutants in the ppm range, adopting the Raman-Lidar principle, is under development.

39523 **APTIC NO. 62006**

RADIOMETRIC DUST METERS. *(Radiometrische Staubmessung). Text in German. In: Elektrische Messgeraete fuer den Umweltschutz. Fachverband Messtechnik und Prozessautomatisierung im Zentralverband der Elektrotechnischen Industrie, Frankfurt, West Germany, 1973, p. 54, 59.*

The principle of radiometry in dust concentration measurement, and commercially available radiometric dust meters are described. Dust is separated on a slowly moving filter band, after which the thickness of the dust layer, and hence the dust concentration in the air or gas is determined by beta ray absorption measurement, without interference by the chemical composition, particle size, temperature, shape, and color of the particles. The automatic, continuously recording radiometric dust meter model FH 62 A by Friesecke und Hoepfner GmbH is suitable for the measurement of low dust concentrations in a range of 0.005-11 mg/cu m in stationary and mobile monitoring stations, and workplaces. Another model; FH 62 C, uses diluted gas samples after isokinetic sampling from gas ducts, and has a measuring range of 1-1000 mg/cu m.

39524 **APTIC NO. 62078**

Lawrence Radiation Lab., Berkeley, Calif. Environmental Instrumentation Group

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING AIR. (VOLUME 1). *National Science Foundation Contract, Rept. LBL-1, 1226p., Dec. 1973, 1296 refs.*

A comprehensive survey of air quality instrumentation is given. Sampling, calibration, data acquisition and reduction, and monitoring instrumentation for various gases are described. Characteristics, sources, effects, control methods, air quality and emission standards, sampling, calibration, data acquisition and reduction, samplers, and analytical methods for sulfur dioxide are reviewed. Characteristics, atmospheric levels, sources, effects, control methods, national air quality and emission standards, sampling, calibration, manual and automatic analytical techniques, and monitoring techniques for nitrogen oxides are described. Characteristics, atmospheric levels, sources, effects, control methods, standards, sampling, calibration, manual and automatic analyzers, and methods for monitoring are described for oxidants and ozone. Characteristics, sources, control, effects, standards, sampling, calibration, data acquisition and reduction, and manual and continuous analytical methods are reviewed for carbon monoxide. Characteristics, sources, effects, controls, sampling, calibration, data acquisition and reduction, manual and automatic analytical methods, and new analytical methods for hydrocarbons are described. Characteristics, sources, forms, toxicology, control, standards, monitoring systems, sampling, calibration, data acquisition and reduction, samplers, and analytical methods for mercury in air are described.

39525 **APTIC NO. 62783**

(Inventor not given.)

APPARATUS FOR DETECTING SMOKE, DUST OR LIKE MATTER. *(European Atomic Energy Community (Euratom), Kirchberg (Luxembourg)) Brit. Pat. 1,321,016. 4p., June 20, 1973. (Appl. April 19, 1971, 16 claims).*

An apparatus was developed for detecting smoke, dust, or similar particulates in a gas by evaluating the absorption of light by the gas. The apparatus consists of a light source, a light detector, and a duct. The arrangement of the light source and the gas carrying duct allow the light travelling in a straight line from the light source to the light detector to cross the path of the duct at least twice. There is no optical element as a reflector or lense provided in the gas path since the gas, and not the light, proceeds in a zigzag manner. Other detectors utilize reflectors in the measuring duct, but they are readily covered with smoke or dust so that the measured signal drops excessively.

1972

39526 **APTIC NO. 62014**

Boudene, C., F. Arsac, and J. Godin

SAMPLING AND DETERMINATION OF ATMOSPHERIC INORGANIC LEAD BY FLAMELESS ATOMIC ABSORPTION. *(Etablissement d une methode de prelevement et de dosage du plomb mineral atmospherique utilisant l absorption atomique sans flamme). Text in French. Commission of the European Communities and Environmental Protection Agency, Proc. Int. Symp. Environ. Health Aspects Lead, Amsterdam, Netherlands, 1972, EUR 5004 d-e-f, p. 1051-1061, May 1973. (Oct. 2-6.)*

After sampling of particulates in the air on a millipore diaphragm with a diameter of 0.45 micron, the filter is dissolved in concentrated nitric acid. The residue after evaporation to dryness is heat-treated with 1% nitric acid solution, an aliquot part of which (10 microlisters) is placed in a graphite spray furnace. The simplicity of this method makes is possible to carry out a large number of routine checks with a single spectrophotometer. Its very high sensitivity also enables these checks to be conducted on short-term (1-hour) samples as well as on 24-hour samples. Finally, its good reproducibility reveals a high degree of correction between its results and those obtained with other methods already employed in monitoring of atmospheric pollution by lead.

39527 **APTIC NO. 62209**

Compton, Bill, Patricia P. Bazydlo, and Gunter Zweig

FIELD EVALUATION OF METHODS OF COLLECTION AND ANALYSIS OF AIRBORNE PESTICIDES. VOLUME I - FIELD EVALUATION AND ANALYSIS. VOLUME II - PESTICIDE FIELD MONITORING DATA. *Syracuse Univ. Research Corp., N. Y., Air Pollution Lab., Environmental Protection Agency Contract CPA 70-145, SURC Proj. L1073-05, EPA-R2-72-004, 155p. and 218p., May 1972. 13 refs.*

An eight station experimental airborne pesticides monitoring network was established using a prototype design pesticide collection system. Sampling was conducted for a 12-month period according to the random schedule of the National Air Surveillance Network at Winter Haven, Florida, Lubbock, Texas, and in New York State at Buffalo, Naples, Rome, Jordan, Lafayette, and Syracuse. Analysis of 202 samples collected showed pesticides present in 68 (33.5%); the pesticides were collected either singly or in combination on 17 sampling days out of 26 possible days (65.4%). The chronological occurrence of the pesticides indicated seasonal appearance beginning in March and ending in October for the southern stations and from April through September in the New York stations. Pesticides were found at essentially the same concentration level and with the same frequency in both urban and rural areas. In Volume II, appendices give computerized data sets obtained from the monitoring network. The data sets indicate the name of the pesticide pollutant, units of measure, pollutant code, sampling method, measured value, and decimal position. The data presented are compatible with the data requirements of the SAROAD (Storage and Retrieval of Air Quality Data) developed at the Environmental Protection Agency and are presented in form for direct keypunching.

39528 **APTIC NO. 61984**

Cross, Frank L., Jr.

AIR MONITORING AND ITS COSTS. *Rhode Island Univ., Coll. of Engineering and Greater Providence Chamber of Commerce. Proc. Northeast. Reg. Antipollut. Conf., 5th, Annu., Kingston, R. I., 1972, p. 312-317. (July 17-20.)*

The three kinds of air monitoring studies are in-plant studies, ambient air sampling, and source testing. Reasons for monitoring, problems in monitoring, and data handling problems are reviewed. Mistakes and problems can increase costs; they can be reduced by using a systematic decision-making approach and by checking with regulatory agencies. Basically, the costs of monitoring and pollution control are transferred to the community or to the consumer. The following will increase industry's concern about air monitoring: standard sampling methods, standard data reduction techniques, a firm basis for criteria and performance standards, good guidelines by regulatory agencies for air pollution control requirements and procedures, uniform enforcement policies, and training programs to acquaint industry with standard methods for sampling and analysis.

39529 **APTIC NO. 62195**

Driscoll, J., J. Becker, J. McCoy, M. Young and J. Ehrenfeld

EVALUATION OF MONITORING METHODS AND INSTRUMENTATION FOR HYDROCARBONS AND CARBON MONOXIDE IN STATIONARY SOURCE EMISSION. *Walden Research Corp., Cambridge, Mass., Environmental Protection Agency Contract 68-02-0320, Program Element A11010, EPA-R2-72-106, 297p., Nov. 1972. 30 refs.*

During the initial phase of the program, the types of monitors for carbon monoxide and hydrocarbons were reviewed, selected, and acquired. Two different techniques for CO were considered for evaluation, e.g., Non-Dispersive Infrared (NDIR) and Process Chromatography (reduction of CO to methane and analysis with a flame ionization detector (FID)). The techniques for HC analysis included FID, NDIR (ethane sensitized), and process chromatography (FID detection) which provides CH_4 and total HC (THC). The advantage of this latter instrument is that reactive (non-methane) HC can be determined by difference. Laboratory tests on the analyzers were conducted in the Walden 500,000 Btu/hr pilot plant. The fuels used were natural gas as well as no. 2 and no. 4 fuel oil. During these tests, determination of accuracy, drift, interferences, and precision, was conducted for CO and HC monitors. The laboratory tests also included the development of wet chemical methods for CO and HC analysis. These techniques would be used to check the accuracy of the instruments in the field. A sampling system for the CO and HC analyzers was assembled and tested. Field tests were conducted at municipal incinerators, iron foundries, and petroleum refineries. For each source that was tested a brief write-up of the process is given. This is followed by the laboratory pilot plant and field studies.

39530 **APTIC NO. 62024**

Ghosh, R. S., Suprio Choudhury, D. K. Roy, and J. Singh

SMOKINESS OF A FUEL DETERMINATION BY OPTICAL SMOKE DENSITY METHOD. *ISI (Ind. Stand. Inst.) Bull., 24(9):390-394, 1972. 4 refs.*

An apparatus to determine the maximum acceptable level of smokiness for domestic coke is detailed. The apparatus was developed and perfected at the Central Fuel Research Institute Shanbad (India) and it can help compare effectively the smoke emission characteristics of different fuels under standardized conditions. The apparatus requires only a few grams of the sample for testing and can determine the smokiness of a sample within a few minutes. In view of the requirements of any future regulation on air pollution control in India, a maximum acceptable level of smoke has been evolved and recommended for domestic coke. Some of the fundamental aspects of coke constitution in relation to its smoke emissions have also been investigated.

39531 **APTIC NO. 62710**

Harrison, P. R.

MONITORING FOR TRACE METALS IN THE ATMOSPHERIC ENVIRONMENT: PROBLEMS AND NEEDS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 123-144. 8 refs. (Oct. 31-Nov. 2.)*

Since there are difficult problems in conducting atmospheric trace analyses, the literature was searched to determine the accuracy and applicability of measurements of trace metals. Literature data was used to determine the methodology which should be used in air monitoring. This research methodology and methods of data representation and interpretation are discussed. Meteorology should be considered as well as statistics to determine transport and sources. Examples of a source inventory study technique are presented representing an area-wide distribution of suspended particulate, its lead fraction, selected wind roses, and urban traffic densities. Another set of data are given showing the dependence of lead levels on wind direction adjacent to a large metropolitan area. Examples are given of the thoroughness required for filter selection for neutron activation studies. Site locations, analytical techniques, interpretations, and methods of presentation should be carefully considered and several areas of expertise should be used to avoid errors in monitoring and data analysis.

39532 **APTIC NO. 61731**

Heath, R.

ADVANCED SENSING TECHNIQUES. *Environmental Protection Agency and Atomic Energy Commission,* *Washington, D. C., Proc. Interagency Conf. Environ., Livermore, Calif., 1972, CONF 721002, p. 333-335. (Oct. 17-19.)*

A discussion on the potential significance of advanced sensing techniques for environmental control is summarized. The analytical areas considered include: organic molecules, elemental analysis, chemical state, physical state, biological assay, and sampling and sample conditioning. There are problem areas where current techniques are unable to provide desired sensitivity to meet measurement requirements, such as in the determination of airborne asbestos fiber and the identification of specific organisms in air and water. There is a need for real time analysis of complex systems.

39533 **APTIC NO. 61733**

Hollowell, C. D.

MONITORING EQUIPMENT I. SURVEY OF AIR MONITORING INSTRUMENTATION. *Environmental Protection Agency and Atomic Energy Commission, Washington, D. C., Proc. Interagency Conf. Environ., Livermore, Calif., 1972, CONF 721002, p. 198-205, 211. (Oct. 17-19.)*

The capabilities of the Atomic Energy Commission and National Aeronautical and Space Administration laboratories in the field of air pollution monitoring instrumentation are summarized. A survey is being published in several volumes. Volume I was published April 1972 and covers sulfur dioxide monitoring. Descriptive literature for over 60 commercially available monitors are included. The monitors are classified into 13 different principles of operation. The strengths and weaknesses of these principles of operation are discussed. Information concerning instrument calibration, sampling, emission standards, techniques for controlling sources, and effects of sulfur dioxide is included. Those air quality pollutants and parameters for which instrumentation is discussed in other volumes is tabulated and includes gases, suspended particulate matter, odors, and meteorological parameters.

39534 **APTIC NO. 62079**

Homolya, J. B.

SOURCE MEASUREMENT FOR OXIDES OF NITROGEN--AUTOMATIC TECHNIQUES. *Air Pollution Control Association, Pittsburgh, Pa., Proc. Air Pollution Control Assoc., South Atlantic Sect., Fall Meet., Oxides Nitrogen Air Pollut. Tech. Meas. Control, Raleigh, N. C., 1972, p. 15-28. 2 refs. (Sept. 19.)*

Automatic techniques for the source measurement for oxides of nitrogen are reviewed and current research by the Environmental Protection Agency is described. Instrumental detection techniques for nitrogen oxides are available in a wide variety of source measurement approaches, such as manual sampling plus laboratory analysis, extractive source monitoring, in-situ measurement, remote sensing, and long path sensing. Sample dilution schemes and improvement of interface techniques are being investigated for extractive source monitoring. A new improved manual sampling method was developed which might replace the EPA standard PDS method. A high level of effort is also being given to development of remote sensing instrumentation. Initial studies and development of prototype instrumentation have focused on the measurement of sulfur dioxide. Much of the technology can be extended for the measurement of NOx. In-situ monitors, employing electro-optical techniques, show great promise for the applications requiring long periods of unattended operation.

39535 **APTIC NO. 62378**

Ikebe, Yukimasa and Kenji Ishida

DETERMINATION OF SUBMICRON AEROSOL PARTICLE SIZE DISTRIBUTION BY DETERMINING DISPERSION COEFFICIENT. III. RESULTS OF MEASUREMENTS. *(Kakusan keisu sokutei ni yoru sabu mikuron earozoru ryukei bunpu no kettei (III), sokutei kekka). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. of Atmos. Electr. Jap.), no. 7:3-6, Aug. 1972. 4 refs.*

Using the calculation analysis method of submicron aerosol particle size distribution by response matrix, actual aerosol particle distributions in the air were examined. Samples were taken four times, twice in July and twice in August, samples A and B between 1 and 3pm, and samples C and D between 10am and noon. The measurements and calculated figures for C and D agreed extremely well, but B did not, probably due to measurement errors from lack of distribution representations. Distribution peaks were different depending on the day, ranging from 0.007 micron to 0.06 micron. More samplings must be taken from actual environment, using an Aitken counter which requires less volume of test material air, to shorten the experiment time. To improve the quality of response matrix, more channels must be used. Ideally, measurements and calculations should be simultaneously obtained.

39536 **APTIC NO. 62337**

Kasprzycki, A.

POLLUTION MEASUREMENTS OF THE ATMOSPHERE AND THEIR INTERPRETATION. *(Pomiary zanieczyszczenia atmosfery i ich interpretacja). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(4):25-42, 1972. 13 refs.*

NTIS: TT 72-54023/4

Atmospheric air pollution measurements, their performance, and the interpretation of readings are discussed. The analysis of the measurement results on dust and sulfur dioxide was carried out on the basis of mathematical statistics and probability mathematics. Control pollutant emission measurements in protected areas should be carried only under unfavorable meteorological conditions for the region affected. Places covered by monitoring should be selected on the basis of a cartographic and mathematical analysis under stated meteorological conditions classified as dangerous. It is admissable to make mobile measurements in selected places in order to minimize the time series and maximize the representativeness of the measuring series for a given area. The confidence level of results should be related only to the harmfulness of the pollutant under test and possibly the economic effects of published excess of the standard atmospheric pollution values. (Author abstract modified)

39537 **APTIC NO. 61029**

Klimisch, H. J. and L. Stadler

A CHROMATOGRAPHIC METHOD USING GEL DISTRIBUTION FOR PREPARATIVE SEPARATION OF POLAR SUBSTANCES FROM POLYCYCLIC AROMATIC HYDROCARBONS. FRACTIONATION OF CIGARETTE SMOKE CONDENSATE. *(Gel-verteilungschromatographisches Verfahren zur praeparativen Abtrennung polarer Substanzen von polyzyklischen aromatischen kohlenwasserstoffen. Fraktionierung von Cigarettenrauchkondensat). J. Chromatog., vol. 67:175-178, 1972. 5 refs. Translated from German, 7p.*

Gel distribution chromatography was used to analyze cigarette smoke condensate. The hexane fraction VI contained 55.4% of the plotted nitromethane fraction V and the polar fraction VII contained 42.8%. The hexane fraction VI contained polynuclear aromatic hydrocarbons, paraffins, olefins, and terpene. The polar fraction VII contained nicotine alkaloids, phenolic substances, the most of the brown pigment materials. A method was developed to reduce losses of phenolic compounds in the polar fraction. The gel chromatographic techniques can be used to separate polar and less polar substances, including polycyclic aromatic hydrocarbons. They can therefore be used for the fractionation of cigarette smoke condensate whose biological effectiveness in experiments on animals is to be tested.

39538 **APTIC NO. 62073**

Koutsandreas, John D. and Robert F. Holmes

REMOTE SENSING FOR ENVIRONMENTAL PROTECTION. *Environmental Protection Agency and Atomic Energy Commission, Washington, D. C., Proc. Interagency Conf. Environ., Livermore, Calif., 1972, CONF 72 1002, p. 212-223, 335. 17 refs. (Oct. 17-19.)*

The activities of the EPA in investigating the role of remote sensing in monitoring activities are outlined. The EPA considers remote sensing to include: sensing of pollutants from satellites and/or aircraft; sensing of pollutants from ground-based remote instruments with the telemetering of data to a central point; sensing of emissions from stationary sources as they emerge from the stack, and long path sensing of emitted pollutants; and the sending of secondary effects of pollutants on ecology by remote means. Research and development in the application of tuned lasers for pollutant monitoring over long paths shows promise for EPA air programs. Experiments are being conducted for monitoring of pollutant densities over several miles. Lasers also show promise as tools for characterizing the size and shape of particulates in the air. This would provide a valuable input to EPA s plans for controlling particulate emissions from fossil fuel burning activities. Within the next 5-6 yr there should be available multi-pollutant analyzers and tuned laser systems with sensitivity and selectivity that should surpass most of the chemiluminescent techniques now in use. The state of the art for the aerial detection and quantification of pollution must be extended. The ability to detect pollution with a camera and multi-spectral analysis has only been started. Greater efforts should be initiated to evaluate the correlation radiometer, lasers, infrared scanners, and microwave radiometers.

39539 **APTIC NO. 61680**

Lederman, S. and M. H. Bloom

REMOTE MEASUREMENT OF AIR POLLUTANTS UTILIZING THE RAMAN EFFECT. *In: Pollution: Engineering and Scientific Solutions. Euval S. Barrekette (ed.), New York, Plenum Publishing Corporation, 1972 (?), p. 438-452. 12 refs.*

The application of Raman scattering to air pollution detection monitoring and measurement is discussed including some theoretical as well as practical aspects of the problem. Positive as well as negative features of the Raman scattering diagnostic techniques are pointed out. The problems associated with the utilization of lasers, the power requirements, frequency selection, pulse repetition rate and reliability are discussed. The diagnostic technique utilizing Raman scattering has sufficient outstanding features to make it particularly suitable for air pollution applications. (Author abstract modified)

39540 **APTIC NO. 62034**

Leser, Robert J. and Jack A., Salzman

LIGHT-DETECTION ELECTRONICS FOR A RAMAN LIDAR. TECHNICAL NOTE. *National Aeronautics and Space Administration Cleveland, Ohio, Lewis Research Center, NASA TN D-6879, Rept. E-6864, Work Unit 113-31, July 1972. 15 refs.*

NTIS: N-72-28455

A light detection system for an optical radar or lidar unit to be used for remote temperature and composition measurements was designed, built, and bench tested. This detection system processes three return signal wavelengths: two Raman wavelengths, and the Rayleigh-Mie wavelength 694.3 nm. Means of coping with photomultiplier tube instabilities and limitations are discussed. Circuits for gain control, ranging, and digitizing are included. The phototube gains can be switched fully on in 80 m or off in 30 m of range. The range circuit processes signals from 0.1 to 2 km, with an estimated range resolution of less than 5 m. (Author abstract)

39541 **APTIC NO. 62506**

Misaki, Masao, Miwako Ikegami, and Isuo Nakazawa

SOUTH SEA AIR POLLUTION MEASUREMENT BY THE ELECTROCONDUCTIVITY METHOD AS AN INDICATOR FOR A BACKGROUND POLLUTION EVALUATION AND THE EFFECTS OF SHIP POLLUTANTS ON THE MEASUREMENTS. *(Bakku guraundo osen no meyasu to shite no taiki denki dendoritsu no nanpo kaiiki no okeru atai to fune yori no osen ga sokutei ni ataeru eikyo ni tsuite). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 7:28-31, Aug. 1972.*

The ion information rate on the ocean is assumed to be constant, and therefore electroconductivity is determined by aerosol concentration. Electroconductivity is a good indicator of aerosol concentration. The air turbidity coefficient is determined almost entirely by particles larger than 0.1 micron, but the ratio of large particles to the total number of particles is extremely small. Therefore the conductivity is actually affected by the concentration of particles less than 0.1 micron. This means that the efficiency factor for the cross section of Mie scattering for microparticles is extremely small, but that of collision cross section of ion aerosols will increase with larger particles. Two electroconductivity apparatus were installed on the highest deck of the expedition ship for the Bonin and Marcus Islands. Originally, it was assumed that the apparatus would be free of pollution by the ship s exhausts as long as the wind was ahead; the slightest wind fluctuation to any angle of the ship, however, caused fluctuation in the measurements. The wind at 20 deg caused 10% and at 90 deg caused 35% errors. The conductivity level was extremely low in Tokyo Bay but increased steadily as far as northern latitude 30, and then stabilized. The most frequent level was about 2.54, and this figure was about 30% higher than the Cobb and Wells measurement of electroconductivity on the Atlantic Ocean.

39542 **APTIC NO. 62826**

Morrison, George H.

SPARK SOURCE MASS SPECTROMETRY FOR THE STUDY OF THE GEOCHEMICAL ENVIRONMENT. *Ann. N. Y. Acad. Sci., vol. 199:162-172, June 28, 1972. 34 refs*

Spark source mass spectrometry is reviewed in terms of the principles of the technique and in terms of its application to multielement trace analysis of geochemical samples such as geological material, air and water samples, plant materials, and animal tissue. The technique employs a vacuum spark source which permits the direct analysis of solid samples. A high-voltage radio-frequency discharge is produced between two closely spaced electrodes of the material to be analyzed. A semiquantitative survey analysis of air pollution particulate matter is cited in which the particulate matter was collected on a nitrocellulose filter pad and, after ashing and mixing with graphite, was analyzed using an electrical detection scanning system. Twenty- eight elements were determined, and the precision of the method was estimated to be plus or minus 30% standard deviation, showing the feasibility of the method for air particulate analysis.

39543 **APTIC NO. 62711**

Ouellette, R. P. and J. W. Overbey II

DIMENSIONS OF MONITORING. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 159-165. 12 refs. (Oct. 31-Nov. 2.)*

Approaches to monitoring methodology and assessment are discussed. Pollution includes multimedia aspects because of interactions of air, land, and water. Basic types of monitoring systems in use are a surveillance system for enforcement actions which tends to be a source monitoring system, and administrative system used for lanning and assessing the impact of control programs, an ambient monitoring system containing a warning subsystem, and a research and scientific system aimed at supporting effects studies and mathematical modeling. Characteristics of these monitoring systems, considerations for each step of the monitoring process, and media and pollutant effects are mentioned. System quality assurance considerations are reviewed. Considerations in monitoring siting, sampling design, and verification procedures are mentioned. Costs and user requirements cause monitoring to be reduced in dimension. Reductions in the amount of data collected are possible within the areal and temporal aspects of collection; topologically sequential areal collection is one example. Correlation matrices can be used to reduce the dimensionality of data. Various analytical techniques such as the batch partitioning approach and various presentation techniques such as indicators/indices can also reduce dimensionality. The purposes of monitoring systems include normative, forecastive, and causative monitoring.

39544 **APTIC NO. 62093**

Parker, J.

LONG-DISTANCE TRANSMISSION OF AIR POLLUTION DATA BY TELEPHONE. *Dept. of Trade and Industry, Stevenage, (England), Warren Spring Lab., WSL-LR 172 (AP), 16p., July 1972. 1 ref.*

Automatic systems for the long distance transmission of air pollution data by telephone are described. There are two systems: one is a slow speed telemetry system for use with an automatic telephone alarm to give warning of episodes of high pollution; the second is a high speed transmission system for use with dispersion work where up to six channels of information may be simultaneously transmitted over the telephone network. The slow speed system was field tested with instruments for measuring sulfur dioxide in London. Automatic warning of high SO2 levels were given and facilities for interrogation were provided. Both systems have been used at different sites within the United Kingdom and at three international exhibitions in Washington, Milan, and Tokyo. The details of the three trials are described. In the low speed system there is little doubt that the mean difference between the original and transmitted values was of the order 0.01 volts which, for air pollution work, is more than adequate. With the high speed system, the frequency responses were satisfactory.

39545 **APTIC NO. 61732**

Poppoff, I.

GLOBAL SCALE MONITORING. *Environmental Protection Agency and Atomic Energy Commission, Washington, D. C., Proc. Interagency Conf. Environ., Livermore, Calif., 1972, CONF 721002, p. 336. (Oct. 17-19.) ABSTRACT*

Global monitoring and its application in air pollution control are discussed. Global monitoring is necessary to observe long term climate modification, to determine background concentrations of pollutants for which standards are being set, to quantify global scale transport of pollutants, and to understand processes occurring in the atmosphere on a global scale. The pollutants in air which should be measured include: carbon monoxide, carbon dioxide, ozone, particulates, washout, mercury, sulfur dioxide, sulfur trioxide, nitrogen oxides, pesticides, and hydrocarbons. The required monitors for global coverage include 10 surface stations, glaciers, aircraft and satellites for air pollutants, ocean vessels, and data buoys.

39546 **APTIC NO. 62709**

Rabin, R.

MONITORING SESSION -- CHAIRMAN S OPENING REMARKS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 121-122. (Oct. 31-Nov. 2.)*

Questions relating to the definition of a pollutant are generally reviewed including the analytical methods to determine trace concentrations, thresholds and toxicity, cause and effect associations between a compound and the compound after changing in the environment, complex transport processes, the need to determine background concentrations, and the need for a team approach to study metal pollutants. Research and monitoring needs are mentioned.

39547 **APTIC NO. 62831**

Rimberg, D., R. Knuth, and L. Hinchliffe

DETECTION OF EMULSIFIER PARTICLES IN LATEX AEROSOLS. *J. Colloid Interface Sci., 40(2):315-316, Aug. 1972. 4 refs.*

Monodisperse polystyrene and polyvinyltoluene latex contains an emulsifier which may be carried along with the latex particles in the form of a very fine aerosol and may affect light scattering measurements. High concentrations of the emulsifier in the optical sensing volume of particle counter can therefore cause spurious counts. Therefore, a method of detecting the presence of the emulsifier particles in latex aerosols was developed. Latex aerosols were deposited on electron microscope grids in a commercial electrostatic aerosol sampler. Differences in shadowed and unshadowed samples of latex were evident. By shadowing the electron microscope grids, the presence of emulsifier particles should be detected.

39548 **APTIC NO. 62329**

Ryszka, E.

CAPACITIVE PROBE (A DEBATING ARTICLE). *(Sonda pojemmosciowa (artykul dyskusyjny). Air Conserv. (English translation from Polish of: Ochrona Powietrza, 6(4):16-24, 1972. 1 ref.*

NTIS TT 72-54023/4

The design and principle of operation of a new probe for dust loading measurement in gases in ducts is discussed. The theoretical foundations of the working of the probe and test results are described, and the advantages and drawbacks of the probe as well as the opportunities for applying it to automatic measurement, are considered. The application of the capacitive probe is dependent upon a number of factors. The probe requires calibration of each individual dust. The behavior of dust particles in front of the probe varies diametrically according to their size. The probe could not be applied, unless previously tested, to horizontal or skew ducts. (Author abstract modified)

39549 **APTIC NO. 62324**

Skogerboe, R. K.

ANALYTICAL CHEMISTRY OF LEAD IN ENVIRONMENTAL SAMPLES. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report, July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 124-147, 1972. 4 refs.*

NTIS: PB 223623

A service and research program is described. The service program largely dealt with determination of the total lead in air, biological tissue, soil, and water samples. The methodologies used are described. Research efforts were directed at developing improved techniques for determining lead at trace and ultratrace levels and at identifying the compound forms of automotive lead as it moves through the environment. Total lead content in soil was measured by emission spectrography and atomic absorption spectrometry. Two soil samples were collected near a highway and analyzed for total lead content which was 1000 ppm, for preconcentration of lead in soil by magnetic separation (the lead concentration in the magnetic fraction of the unground soil samples was increased by more than a factor of two), for density separation of lead (3/4 of the total lead was composed of compounds with a density greater than 3.3 including lead compounds with a lower density but associated with soil particles having a mean density above 3.3), and for combined density and magnetic separations which resulted in the most striking preconcentration of lead. Compounds were identified in the roots of plants to determine mechanisms for lead uptake. Total lead in air was determined using a unique and unusually clean filter material to eliminate the problem of filter blanks. A carbon rod analyzer and an emission spectrometer were studied for analyzing lead in biological samples. To establish the reliabilities of a number of laboratories using different analytical methods, lead was analyzed in human blood, soil, air filters, plant leaves, and a bovine liver. Results are summarized. (Author abstract modified)

39550 **APTIC NO. 61707**

Sneeringer, P. V.

A REVIEW OF THE DEVELOPMENT OF MONITORING METHODS FOR NO2. *Proc. Air Pollution Control Assoc., South Atlantic Sect., Fall Meet., Oxides Nitrogen Air Pollut. Technol. Meas. and Control, Raleigh, N. C., 1972, p. 1-14. 30 refs. (Sept. 19.)*

The history of the development of the methods for monitoring nitrogen dioxide in ambient air, the problems associated with the development, and the subsequent effects on air pollution programs today are reviewed. The methods discussed include: colorimetric procedures; the Saltzman reagent for use in grab gas sampling; and the Jacobs-Hochheiser sampling method. Because of the difficulties in measuring ambient levels of NO2 by these methods, air pollution programs have been affected. Those states that were faced with a deadline of July 31, 1972 to limit nitrogen oxides emissions for enforcement of the NO2 emission limit of 100 micrograms/cu m were granted a year s extension. The 45 air quality control regions originally classified as priority I for NO2 by the Jacobs-Hochheiser method are undergoing an extensive series of NO2 field measurements involving instruments based on chemiluminescence. Part of the reasoning for the rejection of the Maryland implementation plan was that NOx emission standards were not set for existing fuel-burning equipment. The present Maryland guidelines of best technology available promulgated partly due to inaccuracies in measuring NOx are presently being contested by the Environmental Protection Agency.

39551 **APTIC NO. 61957**

Tepper, L. B.

ANALYTICAL CONSIDERATION. *In: Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 10, p. 229-241.*

The analysis of environmental metals is discussed and some specific techniques are presented. Airborne metals are almost always particulate rather than gaseous. Particulates can be collected on a filter medium through which air is drawn by a pump. Particulates can also be separated from the air by impingement in a liquid-filled collector or by precipitation of charged particles in electrostatic fields. Organolead or mercury compounds which exist as volatile non-particulate material may be extracted from the air by adsorption on charcoal or by direct reaction with a specific chemical reagent. Laboratory procedures for analysis include wet chemical and instrumental methods. Wet chemical methods are based upon the development of a color, the intensity of which is measurable and related to the amount of the metal being assayed. Instrumental methods of analysis incluclde spectrophotometry and spectroscopy. Preferred analytical techniques and standard values are given for arsenic, beryllium, cadmium, chromium, fluoride, lead, manganese, mercury, nickel, and vanadium.

39552 **APTIC NO. 62265**

Tillery, Marvin Ishmael

A CYLINDRICAL AEROSOL SPECTROMETER. *Rochester Univ., Rochester, N. Y., Dept. of Radiation Biology and Biophysics, Atomic Energy Commission Contract, 64p., 1972. 44 refs.*

NTIS: UR 3490 172

A cylindrical aerosol spectrometer utilizing a new inlet system was developed. It separates airborne particles in the respirable size range according to their aerodynamic characteristics. Calibration curves for the instrument were determined for several sampling rates and rotational speeds. By varying the operating conditions of the instrument, it can separate particles from 0.060 micron in diameter. When operating at 4000 RPM with a channel flow of 5 l/min and a sampling rate as high as 0.5 l/min, the instrument separates particles from 0.32 micron to 2.5 micron. Modifications are suggested that should extend the range to much larger particles. The instrument is relatively simple in design and small enough to be used as a portable sampling instrument. (Author summary)

39553 **APTIC NO. 62461**

Toriyama, Tetsuji, Yasuhiro Morita, and Seiji Ishikawa

ADJUSTMENT METHOD FOR POLLACK COUNTER IN LOW CONCENTRATION AREAS. *(Porakku kaunta no teinodoiki kakusei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 7:11-14, Aug. 1972.*

For measuring a low concentration of submicron aerosols by Pollack Counter, there are four ways of adjusting the apparatus: count the particles by eye or photograph by placing a microscope lense directly in the counter; drop water particles on the plate and count the traces of water; regard the Pollack counter figures as correct, dilute aerosol samples with air and calculate the aerosols in the air from the dilution rate; or observe the diameters of the particles through the microscope and observe the degree of light scattering and decrease as it passes through the particles and calculate. These methods are further discussed. To check the differences in the qualities of nuclei, prepare salt microparticles by colliding magnesium oxide with water drops. An 0.1% solution will produce 5 micron salt particles fairly uniformly (70%). These particles can be compared with particles emitted from land sources.

39554 **APTIC NO. 61687**

Westermark, T. and K. Ljunggren

THE DETERMINATION OF MERCURY AND ITS COMPOUNDS BY DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS. *In: Mercury Contamination in Man and his Environment. International Atomic Energy Agency, Vienna (Austria), TR 137, 1046, p. 99-110, 1972. 28 refs.*

The application and development of a method for the determination of mercury and its compounds by destructive neutron activation analysis for air pollution abatement are discussed. By means of activation analysis of environmental samples, sources of Hg emissions to the environment can be revealed and the paths which the element follows in nature can be traced. For control of fish and mammals in ecological projects, destructive activation analysis is ideally suited. Also for checks on blood and hair of extreme fish eaters or persons otherwise subjected to Hg uptake, the method is very convenient. The method can be combined with gas chromatography for methylmercury and ethylmercury determination for assessing the risks of harmful exposure. The analysis of Hg can be conveniently combined with the determination of other trace elements as arsenic and cadmium. (Author conclusions modified)

39555 ***APTIC NO. 6692***

Organisation for Economic Co-operation and Development, Air Management Research Group

SAMPLING AND ANALYTICAL TECHNIQUES. In: Air Management Problems and Related Technical Studies. p. 53-69, 93-95, 1972. 41 refs.

Present measurement capabilities are reviewed for those air pollutants specified to be of priority interest in respect to both effects and abatement. Gaps in measurement capabilities are indicated and future research program recommended. The pollutants discussed include: asbestos--no sampling problems since adequate organic membrane filters are available; carbon monoxide--no measurement problems for concentration normally found in urban atmospheres; fluorides--no continuous method for routine measurement, not possible to distinguish between gaseous, particulate, and organic fluorides; heavy metals and other elements--number of mehods available, but costly and time consuming; organic lead (fuel additive)--methods available for separating and identifying total organic lead; non-metallic organic compounds--no routine methodology developed; nitrogen oxides--no direct methods for nitric oxide, Saltzman method for nitrogen monoxide and nitrogen dioxide; oxidants and ozone-- routine methods available for ozone, but not for other oxidants; sulfur compounds--adequate measurement methods available or being developed; odors--not studied in detail; pesticides--need for a total system of sampling and analysis.

39556 **APTIC NO. 61693**

Organisation for Economic Co-operation and Development, Air Management Research Group

MEASUREMENT OF PARTICUALTE MATTER BELOW 10 MICRONS. *In: Air Management Problems and Related Technical Studies. p. 71-72, 1972. 41 refs.*

The measurement of particulate matter below 10 micron is discussed. The proportion of the total suspended matter in the fine particulates size range will increase as present abatement techniques are implemented. The effects of fine particulate matter both on health and climate may be recognized as more apparent as total volume and variety of emissions increases. In general, adequate sampling techniques for these substances exist, including size fractionation. Techniques for determining physical characteristics are available. There is a need for routine monitoring of fractionated samples of fine particulate matter.

39557 **APTIC NO. 61694**

Organisation for Economic Co-operation and Development, Air Management Research Group

AIR MONITORING. *In: Air Management Problems and Related Technical Studies. p. 73-81, 93-95, 1972. 41 refs.*

The need for air monitoring on a global level is discussed and parameters for an integrated monitoring network are suggested. The different environmental circumstances under which monitoring is required may be classified as urban, near urban, and remote. The objectives of a geophysical monitoring network are to determine trends in concentrations of global pollution and to compile an atmospheric pollution climatology. The design of a satisfactory system for providing international comparability for measurement will require examination of the following: identification of pollutants; choice of standard measurement techniques; correlation tests; and the desirability of establishing common test procedures and recommended analytical and sampling methods. Suggested parameters for an integrated monitoring network include: stating individual pollutants, type of monitoring and frequency of sampling, location of sampling devices, three- dimensional requirements for monitoring, standardization of measurement, data handling systems, calibration and reliability of automatic instruments, and related telemetering system.

39558 **APTIC NO. 61696**

Organisation for Economic Co-operation and Development, Air Management Research Group

CONCLUSIONS: THE PRINCIPAL AREAS OF DEFICIENCY IN TECHNICAL CAPABILITY. *In: Air Management Problems and Related Technical Studies. p. 87-88, 93-95, 1972. 41 refs.*

The principal areas of deficiency in technical capability on measurement and monitoring are listed. Seven areas of development are needed: wider range of field measurement capabilities; international standard reference methods; standard reporting of measurements; predictive models of air pollution situations; research programs on physical and chemical transformation in the atmosphere; continuing direct measurements in stack and ducts; and source and emission inventories.

1971

39559 **APTIC NO. 62844**

Collins, R. D., D. M. DeVries, J. E. Elliston, and K. E. Elgar

SAMPLING TECHNIQUES AND METHODS OF ANALYSIS FOR VAPONA INSECTICIDE IN AIR AT SUB-MICROGRAM LEVELS. *Preprint, Association of Official Analytical Chemists, Washington, D. C., 21p., 1971. (Proceedings of the Association of Official Analytical Chemists Annual Meeting, 85th, Oct. 11-14, 1971.)*

A series of experiments are conducted to determine the most efficient means of extracting and quantitating VAPONA insecticide (a pesticidally active material containing not less than 93% 2,2-dichlorovinyl dimethyl phosphate) from air. Bubbling the air through distilled water or ethyl acetate using a single trapping device, available from standard equipment sources, at sampling rates of up to 6 l/min, quantitatively extracts VAPONA from the air. Ethyl acetate solvent affords the best precision when using gas-liquid chromatographic analysis techniques. Quantitation can be accomplished by either GLC or enzyme inhibition procedures. The procedures have been effectively used to determine VAPONA concentrations in the air of homes treated with Shell s NO-PEST Strip. (Author summary modified)

39560 **APTIC NO. 61628**

Merten, Ulrich and Peter Kellogg Gantzel

DEVICE FOR THE SELECTIVE DIFFUSION SEPARATION OF GASES. *(Vorrichtung zum Abtrennen eines oder mehrerer Gase aus einem Gasgemisch). Text in German. (Gulf Oil Corp., San Diego, Calif.) W. Ger. Pat. Appl. 1,719,557. 7p., Sept. 2, 1971. 5 refs. (6 claims).*

A device for the diffusion separation of one or more gases from a gaseous mixture, such as helium-nitrogen, hydrogen-carbon monoxide, helium-methane, helium-neon, or oxygen-nitrogen, is described. The diffusion apparatus comprises a chamber divided by a non-porous membrane into two parts, the membrane being supported on a porous membrane. The non-porous membrane and porous membrane are constructed as a double membrane of cellulose acetate. The double membrane is dried by various solvents, and freeze-dried. The non-porous membrane, not more than 2 micron in thickness, is on the high-pressure side.

39561 **APTIC NO. 61621**

Weidinger, Joachim, Wolfgang Hoeth, and Dieter Petrick

PORTABLE TEST GAS SAMPLE SUPPLY DEVICE. *(Tragbares Geraet zum Foerdern von gasfoermigen Stoffen durch Pruefroehrchen). Text in German. (Auergesellschaft GmbH, Berlin (West Germany)) W. Ger. Pat. Appl. 1,933,047. 4p., Jan. 7, 1971. 8 refs. (1 claim).*

A portable device for quantifying gas samples for test tubes at high accuracy is described. The device is equipped with an electromotor-driven membrand pump, a timer circuit with a counter, and a resistive-capacitive unijunction transistor arrangement for clock pulse generation. Parallel to the capacitor, there is a transistor which is opened for a short time at the intervals of the clock impulses. The apparatus has the advantage of having constant timing whether it is used continuously or with prolonged interruptions.

1970

39562 **APTIC NO. 62317**

Kogan, Y. I., R. S. Repina, D. V. Novozhilova, L. I. Krugman

METHOD FOR DETERMINING THE DISPERSED COMPOSITION OF AEROSOLS. *Russ. Pat. 285,326, 3p., Oct. 29, 1970. Translated from Russian by Paul J. Reiff, Air Force Systems Command, Wright Patterson AFB, Ohio, Foreign Technology Div., FTD-HT-23-509-74, A1110282, 6p., Oct. 10, 1973.*

NTIS, DDC: AD768 426

A method is described for determining the dispersed composition of aerosols by certain values of the mean particle radii as found experimentally from various measurement schemes having different averaging laws. The calculation nephelometric method can be used in combination with the coagulation, weight calculation, and active calculation methods. In order to increase the accuracy of analysis the average values of particle size are determined by several independent methods with known and considerably different laws of averaging. The distribution parameters for particle size are calculated according to the degree of divergence of the obtained average values, with consideration of the corresponding averaging laws.

39563 **APTIC NO. 61633**

Maurer, Otto and Peter Kolbow

SOLID PARTICLES DETECTOR FOR GAS STREAMS. *(Einrichtung zum Feststellen von Feststoffpartikeln in einem Gasstrom). Text in German. (Siemens AG, Berlin and Munich (Germany)) W. Ger. Pat. Appl. 1,900,767. 3p., Aug. 13, 1970. 3 refs. (3 claims).*

An apparatus for the detection and semi-quantitative determination of dust entrained by gas streams filtered in bag filters is described. Rod-shaped sensors are placed in the gas outlets of each bag filter perpendicularly to the flow direction, so that particles entrained by the gas stream may strike against it. The sensor is connected with the active part of a microphone placed in a housing insulated against environmental noise. The particles striking against the sensor produce a signal in the output section of the microphone circuit. The output voltage is proportional to the number of particles striking against the sensor.

39564 **APTIC NO. 61004**

Japan Standards Assoc., Technical Committee on Measuring Dust Content in Stack Gas

METHODS OF MEASURING DUST CONTENT IN STACK GAS. JIS Z 8808-1970. *(Endo haigasu chu no baijin ryo no sokutei hoho. JIS Z 8808-1970). 1970. Translated from Japanese. Leo Kanner Assoc., Redwood City, Calif., 93p., Jan. 1974.*

The Japanese industrial standard for measuring dust in stack gas is presented. The selection of measurement positions in cases of negligible accumulation of dust in the stack and of non-negligible accumulation is outlined. Methods of measuring moisture content and mass per unit volume of stack gas are described. The methods for measuring moisture include the hygroscopic tube, condenser, and calculation methods. Methods of finding the flow velocity and flow rate of the stack gas are reviewed including the measurement instruments and methods, the flow velocity, and the wet and dry stack gas flow rate. Dust sampling methods include the point and mobile sampling methods. The collecting positions and sampling points, composition of sampling equipment, suction of exhaust gas, types and structures of sampling tubes, and types, performance, positioning, and selection of dust collection devices are described. Methods of measuring suction gas flow rates when using a throttling flowmeter, an area flowmeter, or a gas meter are reviewed. Dust tubes and filter paper methods are described. The calculation of the dust concentration in dry stack gas and of the mean dust concentration in the entire section are also reviewed.

1969

39565 **APTIC NO. 62841**

Maurer, Otto

APPARATUS FOR MEASURING LIGHT ABSORBING SUBSTANCES IN FLUIDS, ESPECIALLY SUSPENDED PARTICLES IN GASES. *(Einrichtung zur Messung des Gehalts an lichtabsorbierenden Stoffen in Fluiden nach dem Einstrahlprinzip). Text in German. (Siemens AG, Munich (West Germany)) W. Ger. Pat. Appl. 1,942,942. 4p., March 26, 1970. 3 refs. (3 claims).*

Equipment is described for the measurement of the concentration of light absorbing substances (dusts) in fluids or gases by single beam light extinction. It comprises a light source on one side and a photoelectric receiver on the other side and a measurement path. A control circuit influencing the light source for the purpose of maintaining a constant photo current of the photoelectric receiver, consists of an amplifier with a voltage-comparing circuit located at the entrance of the amplifier. For changing the effective length of the measurement path, a plane parallel transparent plate is arranged on one end of the path perpendicularly to the optical axis which oscillates in direction of the optical axis with a constant amplitude corresponding to a fraction of the length of the measurement path.

39566 **APTIC NO. 57973**

Morikawa, Masahiro, Kenkoku Azuma, and Shigeaki Hirano

HYDROGEN FLAME IONIZATION DETECTOR FOR CONTINUOUS MEASUREMENT OF AUTO-EXHAUST HYDROCARBON EMISSIONS. *(Suisoen-ionka-kenshutsuhoh niyoru jidohsha kaikigasuchuh tankasuiso-nohdo no renzokusokutei). Text in Japanese. Mitsubishi Denki Giho, 43(3):407-415, March 1969. 8 refs.*

A hydrogen flame ionization detector was developed for continuous measurement of the total hydrogen content of automobile exhausts. The detector has a response time of less than 2 sec, a uniform, linear detectability for C content of 10 to 2000 ppm, and an accuracy within 1%. Fast response was achieved by using a capillary branch from the main feed to the burning chamber. Linear detectability was improved with a 2 mm diameter nozzle and short, 300 volt electrodes. To demonstrate the effectiveness of this device, hydrocarbon emissions from a JIS mode test cycle were measured with it in combination with a nondispersive infrared analyzer. This combination of instruments is recommended for determining engine condition in the control of pollution.

39567 **APTIC NO. 61042**

Rampon, H.

STUDY ON ATOMIC ABSORPTION SPECTROPHOTOMETRY INTERFERENCE. *(Etude des interferences en spectrophotometrie d absorption atomique). Chim. Anal. (Paris), 15(12):627-638, 1969. 3 refs. Translated from French, 35p.*

The principle of atomic absorption spectrophotometry and measurement methods are reviewed. Interferences in the measurement were studied using acetylene/compressed air and acetylene/nitric oxide flames. The influence of control parameters on results were studied. Then interactions due to the emission of varying flame radiations were reviewed. Spectral interferences are produced by an element absorbing at the same wavelength or at a close wavelength or by a molecular absorption band. Ionization interferences affect the elements capable of being transformed into ions by means of an increase in flame temperature. A certain number of atoms, while being ionized, pass to an excited state, leave the fundamental state, and are no longer capable of absorbing the photons emitted by the source. There is therefore a lowering of the absorption due to the decrease in free atoms. Matrix interferences such as viscosity and concentration of dissolved salts can occur in a solution whose concentration in dissolved substances is greater than 2% and whose viscosity is different from that of standard solutions. The most important and most common interference is chemical due to incomplete dissociation of compounds and to the formation of refractory compounds in the flame. Examples of these interferences and means of combatting them are described.

39568 **APTIC NO. 61612**

Simon, Wilhelm

QUANTITATIVE GAS ANALYSIS. *(Verfahren and Vorrichtung zur quantitativen Gasanalyse). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 1,498,975. 6p., April 3, 1969. 5 refs. (2 claims).*

Methods and apparatus for the quantitative analysis of known components of gaseous mixtures after successive elimination of the individual constituents are described. The apparatus consists of at least one series of circuits, each having an initial thermal conductivity cell, apparatus for retaining one particular component from the mixture, and a second thermal conductivity cell. The specimen mixture is introduced at one end of the evacuated apparatus, and then after the pressure in the apparatus has equalized, the difference in the thermal conductivities under stationary conditions is measured. The method is especially suitable for the quantitative determination of carbon dioxide, oxygen, hydrogen, and generally of combustion products of organic compounds.

1968

39569 **APTIC NO. 61043**

Zawta, B. and W. Hoelzel

CHROMATOGRAPHY ON POLYAMIDE. A REVIEW. PART 1: THE SEPARATION FUNCTION IN CHROMATOGRAPHY ON POLYAMIDE. *(Die Chromatographie an Polyamid. Eine Uebersicht. Teil 1: Die Trennfunktion bei der Chromatographie an Polyamid). Pharmazie, vol. 23:174-177, 1968. 9 refs. Translated from German, 15p.*

In recent years, purely organic supports have been used for chromatography, along with the usual inorganic support materials such as silica gel and aluminum oxide. These organic supports include polyamides of the Perlon and Nylon types. The major advantages of polyamide over other supports are their high charging capacity and their moderate polarity. The high charging capacity make polyamides particularly suited for preparative chromatography as well as for the analysis of biological materials. Chromatography can be made quite variable on polyamides by modification of the sorption and partition effects. Because of the moderate polarity, it is possible to make the stationary phase (polyamide swollen with mobile phase) either more polar or less polar than the mobile phase. One can then work directly two- dimensionally with normal and inversed phases. Since the sorption is also dependent on the steric structure of the substances, structural isomers can be separated particularly well on polyamides. The most important works on the theory of the separation function on polyamides are reviewed. According to theoretical considerations, sorption and partition separation mechanisms determine the ability of polyamides to be chromatographic supports. The correctness of the theoretical considerations can be confirmed by model experiments. General suggestions for potential applications and suitable chromatographic conditions are described.

1967

39570 **APTIC NO. 61063**

Sato, Shinsaku and Kaku Kikuchi

MEASUREMENT OF SULFURIC ACID MIST. *(Ryusan misuto no sokutei). Fukuoka Prefectural Health Inst. (Japan); Miyagi Prefectural Health Inst. (Japan); and Osaka Municipal Health Inst. (Japan), 1967 (?). 21 refs. Translated from Japanese, 36p.*

Methods for measuring sulfuric acid mist which is generated under various conditions and which is often present with sulfur dioxide are described. Studies were made of high-sensitivity methods of measuring sulfuric acid mist as sulfate, of measuring sulfuric acid mist in the atmosphere, and of measuring sulfuric acid mist in field tests in polluted areas and in disturbing substances. The high-sensitivity methods capable of determining 10 micrograms/cu m sulfate in polluted areas include colorimetry of the complex formed by the reaction between chloranilic acid and tin salts, and sensitized colorimetry produced by pH shift of the chloranilic acid solution. Sampling methods include the absorbing liquid collection method and the paper collection method such as that using hi-volume samplers. The hi-volume sampler was used to estimate sulfur dioxide and sulfate. Methods tested for measuring 0.2-0.02 ppm sulfur trioxide in the atmosphere include tests of the antimony(II)-strong phosphoric acid method. In other tests, SO_2 ans SO_4 were separately estimated by the pararosaniline method and Torin colorimetry in Osaka. An automatic conductivity method was used to estimate sulfur oxides and other pollutants were measured on the roof of the Osaka Municipal Health Institute. Advantages and disadvantages of these methods, and interferences caused by photochemical actions and interfering substances are reviewed. The results of these measurements in Osaka are presented in tables. Torin colorimetry was reliable for measuring sulfur oxides, and electric conductivity gave results for SO_2 plus SO_4. The relationships between SO_4 and SO_2 concentrations and atmospheric temperature, humidity, wind, suspended dust, and other factors are discussed. On polluted days, the SO_4 content was an average of 22% of the SO_x; the ratio of H_2SO_4 to SO_4 was 20-90%. Results for Torin colorimetry and electroconductivity agreed well.

1960

39571 **APTIC NO. 61001**

Schulek, E., K. Burger, and M. Feher

ON THE HYDROLYSIS AND ANALYTICAL TESTING OF NITRIC ACID ESTERS (NITROBODIES). *(Ueber die Hydrolyse und analytische Kontrolle der Salpetersaeureester (Nitrokoerper)). Eoetvoes (L.) Univ., Budapest (Hungary), Inst. for Inorganic and Analytical Chemistry, 1960 (?). 3 refs. Translated from German, 9p.*

The nitric acid esters of some polyalcohols and polysaccharides are important products of the explosives industry. The quantitative determination of these compounds, the so-called nitrobodies, is a problem because degradation products form on the alkaline hydrolysis of these materials. The hydrolysis of some nitrobodies, nitroglycerin, pentaerythritol tetranitrate, nitrocellulose, and nitrostarch, were studied to determine methods for their determination. The ammonia, cyanide, nitrate, and nitrite content of the alkaline hydrolysate, prepared under identical conditions, of some nitric acid esters were determined. The mutual proportions of nitrate and nitrite were then calculated. The average ratio was 1:0.83 for pentaerythritol tetranitrate; 1:2.14 for glyceryl trinitrate and nitrostarch; and 1:1.46 for nitrocellulose. In contrast to the other nitrobodies studied, no cyanide could be detected in the hydrolysate from pentaerythritol tetranitrate. The analytical results are suitable for characterization of the nitrobodies.

AIR QUALITY MEASUREMENTS

1974

39572 **APTIC NO. 62533**

Auliciems, A. and I. Dick

AIR POLLUTION MEASURED BY HUMAN RESPONSE. A CASE STUDY IN BRISBANE. *Clean Air J. Clean Air Soc. Australia, New Zealand), 8(1):2-4, Feb. 1974. 7 refs.*

Air pollution severity in Brisbane, Australia was mapped according to the number of complaints received by the Air Pollution Council in Brisbane. Complaints were linked to their perceived source, thus depicting what may be regarded as areas affected by pollution from a particular source. Different sizes of circles representing the sources were graded according to recency and, therefore, to the present day significance of the perceived source. Inspection of land use maps revealed that the frequencies of directional linkages were closely related to areas of predominantly residential land use. There was little evidence to suggest that complaints were related to the prevalent NE-SW axis of air movement across the city. Insufficient data were available on the urban air circulation to permit an estimation of the relative importance of wind direction and speed to local air pollution levels.

39573 **APTIC NO. 62438**

Bressan, D. J., R. A. Carr, P. J. Hannan, and P. E. Wilkniss

THE DETERMINATION OF TRACE METALS AND FLUORIDE IN MINERALOGICAL AND BIOLOGICAL SAMPLES FROM THE MARINE ENVIRONMENT. *J. Radioanal. Chem., 19(2):373-381, 1974. 10 refs.*

Neutron activation analysis was used to measure trace metals in dust collected over the Atlantic Ocean, and photon activation analysis was used to measure fluoride in the dust. Mercury was also analyzed by neutron activation, but in a slightly different way. The results are presented for samples from the Atlantic, the Carribean, the Greenland Sea, the Pacific, and near the east coast of the U. S. Results agreed well with those done by other methods. The composition of the dust was close to the composition of average crustal rocks, thus agreeing with the contention that most dusts were from the continents or from volcanic eruptions. Instrumental neutron activation analysis of mercury presented some difficult problems. Despite the uncertainty of a 30% error, it was apparent that mercury concentrations in atmospheric dust exceeded those found in average crustal rocks (0.08 ppm) by about two orders of magnitude. The levels of fluoride lent additional support to the dust's continental origin, since fluoride content exceeded that of sea salt in air by a factor of more than 10. Mercury uptake by marine algae was also studied. In the radiotracer experiments, neutron activation analysis was used to determine the mercury content of the algae. The research methodology, results, and problems of the study are described. The amounts of mercury determined ranged from 10 to 40 micrograms.

39574 **APTIC NO. 62813**

Davies, C. N.

SIZE DISTRIBUTION OF ATMOSPHERIC PARTICLES. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluces, 11th, Paris, France, 1974, p. 31-1-31-17. 5 refs. (May 8-10.)*

The size distribution of atmospheric particles cannot be represented by the Junge power law, as a coherent function, because this law is independent of the large particles. The shape of the atmospheric distribution is governed by the sources of aerosol. A method of fitting the distributions by number and volume of particles with lognormal components is described. As an illustration, the experimentally measured distributions of Los Angeles smog are fitted with seven components. (Author abstract)

39575 **APTIC NO. 61910**

Goto, Norihiro

AIR POLLUTION IN THE NIIHAMA AREA. *(Niihamashi no taiki osen ni kansuru kenkyu). Text in Japanese. Niihama Kogyo Koto Senmon Gakko Kiyo (Mem. Niihama Tech. Coll.), vol. 10:73-80, Jan. 1974.*

Nitrogen oxides and oxidants were analyzed by the Saltzman method and the potassium iodide method, respectively. The NOx concentration measured on Sept. 22, 1972 at Niihama Inst. of Tech. was 0.135 ppm at 10:18 am, 0.188 pm at 12:07 pm, and 0.072 ppm at 3:38 pm, with a wind velocity of 1 to 2 m/s. The oxidant concentration at the Municipal building on Aug. 30, was 0.0124 ppm at 10:00 am and 0.0241 ppm at 1:22 pm, whereas that at the Institute on Sept. 22, was 0.0285 ppm at 9:10 am, 0.0366 ppm at 1:45 pm, and 0.0155 ppm at 3:05 pm. The NOx concentration increased as the amount of traffic increased but decreased as the solar radiation became stronger and the oxidant concentration increased. The diffusion rate of NOx from the street was small and the amount of oxidants formed was directly proportional to the radiation intensity of sunlight. Exhaust gas studies of a gasoline engine showed that carbon monoxide concentration was low but NOx concentration was high when the combustion temperature was high, whereas the opposite was true when the combustion temperature was low.

39576 **APTIC NO. 62487**

Kato, Tatsuo and Shinji Nakayama

POLLUTION OF TUNNELS BY AUTOMOTIVE EXHAUST GASES. *(Tonnerunai no jidosha haiki gasu osen). Text in Japanese. Preprint, Japan Inst. for Architecture, Tokyo, p. 17, 1974. (Presented at the Japan Institute for Architecture Symposium on Safety Engineering, 5th, Tokyo, Japan, June 20-21, 1974, Paper 9.)*

The level of automotive emission concentrations in and outside a tunnel was investigated in Yokohama. Measurements were taken at 93 points inside and outside of a 270 m-long, 11.5 m-wide highway, including 150 m on both entrances. The traffic amount was 19.1 cars/min one way, and 11.1 cars/min the other way. Samples were taken with a 5 ml polyethylene tube, tightly capped, and taken back to the lab for gas chromatographic and FID analysis for carbon monoxide. The level of CO was high inside the tunnel and gradually diffused up to 200 m outside the tunnel. The levels of heavier traffic ranged from 20 ppm at the entrance, 40 to 110 ppm inside the tunnel, to 30 ppm at the exit. With less traffic the levels at the entrance and exits were about 40 ppm, but the maximum in the tunnel was 80 ppm.

39577 **APTIC NO. 62873**

Lovelock, James E. and Stuart A. Penkett

PAN OVER THE ATLANTIC AND THE SMELL OF CLEAN LINEN. *Nature (London), 249(5456):434, May 31, 1974. 3 refs.*

Since ozone at concentrations in excess of 0.1 ppm has been observed in the summertime air over southern England, probably from photochemical reactions, peroxyacetyl nitrate (PAN) was measured from a ship crossing the Atlantic. Average daily concentrations of apparent PAN and trichlorofluoromethane (CC13F) are presented in a chart. Samples were drawn through plugs of wool which were strong sources of PAN and of peroxyproprionyl nitrate; the wools possessed the characteristic odor of linen after they were dried in the open air. The potential for PAN formation was most marked on days of unobstructed sunshine and when the ship passed through a polluted air mass. The sea was the most probable source of lower unsaturated hydrocarbons. These preliminary observations suggested that PAN and similar compounds can be formed in the clean air of remote maritime regions by heterogeneous reaction if a suitable surface is provided.

39578 **APTIC NO. 62535**

Lowe, D. C.

ATMOSPHERIC CARBON DIOXIDE IN THE SOUTHERN HEMISPHERE. *Clean Air J. Clean Air Soc. Australia, New Zealand, 8(1):12-15, Feb. 1974. 13 refs.*

The effects of atmospheric carbon dioxide in the southern hemisphere resulting from increasing consumption of fossil fuels in North America and Western Europe are reviewed, and carbon dioxide monitoring results are presented from New Zealand sampling sites. Most fossil CO2 is injected into the atmosphere of the mid-northern latitudes due to the large concentration of industry in North America and Western Europe and results in a negative CO2 gradient between the Northern and Southern Hemispheres. The concentration gradient drives some of the industrial CO2 from the Northern Hemisphere across the intertropical convergence and into the Southern Hemisphere. Most of this is probably absorbed in the large, well stirred, surface of the southern Pacific Ocean. Preliminary data taken at Baring Head over the six-month period from December 1972 to May 1973, indicate a general increase in the CO2 concentration of southern mid-latitude marine air of about 0.4 ppm. An insufficient amount of data have been obtained to determine whether this increase is part of a seasonal oscillation which occurs over a broad region of the southern Pacific or is evidence of a general increase of atmospheric CO2 caused by fossil fuel combustion.

39579 **APTIC NO. 62575**

Murata, M., H. Shima, S. Hayakawa, M. Kawakami, N. Ito, Y. Yoshida, and S. Mizutani

STUDIES ON SUSPENDED PARTICULATES - STUDY ON RELATION BETWEEN SUSPENDED PARTICULATES AND OXIDANTS. *(Fuyu funjin ni kansuru kenkyu - ryushi-jo busshitsu to okishidanto no sogo kankei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(2):139-142, Feb. 1974. 9 refs.*

The examination of daily average concentrations of oxidants, sulfur dioxide, and particulates at Yokkaichi City has been carried out from June to July when the photochemical smog occurs. The petrol industrial zone is located at the beach of Yokkaichi City and the highway goes from the beach to the center of city. The contribution of nitrogen oxides emission from fixed sources is 90%. The measuring point was set at the city center. All pollutants increased when the photochemical smog emergency warning was called. The conditions for producing high concentration of oxidants are low wind speed, low humidity, the increasing of particulate concentration and the accumulation of pollutants. The close relation between concentrations of oxidants and nitrate in the air made clear that a large amount of nitrate exists when the photochemical smog appears. Manganese and vanadium salts act as oxidation catalysts to produce nitrate aerosol.

39580 **APTIC NO. 61897**

Okamoto, Michiko, Shigeo Iiri, Masayoshi Okamato, Hiromi Yoshida, and Takeo Hashimoto

METAL COMPOSITION IN SUSPENDED PARTICULATES AND THE BEHAVIOR OF OZONE. *(Fuyu funjinchu no kinzoku seibun to ozon no kyodo ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 688, 1974. (Presented at the Japan Chemical Society, April Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G33.)*

As part of studies on the mechanism of ozone formation and decompositon, the relationship between metal components in suspended particulates and ozone concentration was studied. The air along the Tokyo-Yokohama No. 2 highway was sampled for 8 hr during the day at the speed of 25-30/min, and suspended particulates total quantity, iron, copper, lead, zinc, and manganese components were measured. Eight-hour averages for ozone, nitric oxide, and nitrogen dioxide were also obtained. An example of a clear reverse correlation between suspended particulates and ozone is presented by a graph. Drastic decreases of ozone and sudden increases of suspended particulates occurred at 12:30 noon and between 4-6 pm. The concentrations of metals are generally similar to the behavior of NO, but there is a clear minus correlatin with O3 concentration; especially Fe, Zn, and Mn show clear reverse correlation with O3. The Cu and Pb did not show clear patterns with ozone or any other metals. From these facts, it was suspected that Fe, Zn, and Mn might be contributing to decomposition of O3.

39581 **APTIC NO. 62530**

Rumler, F., H. Neis, and R. Herbolsheimer

STATIONARY SULPHUR DIOXIDE MEASUREMENTS IN VOELKLINGEN AND BERUS BETWEEN APRIL 1, 1970 AND MARCH 31, 1973 AS WELL AS IN SAARBRUECKEN BETWEEN DECEMBER 1, 1971 AND MARCH 31, 1973. *(Stationaere Schwefeldioxidmessungen in Voelklingen und Berus vom 1. April 1970 bis 31. Maerz 1973 sowie in Saarbruecken vom 1. Dezember 1971 bis 31. Maerz 1973). Text in German. Staatlichen Institut fuer Hygiene und Infectionskrankheiten Saarbruecken. Schriftenreiehe herausgegeben vom Minister fuer Arbeit, Sozialordnung und Gesundheitswesen des Saarlandes, (7):23-34, 1974.*

The results of measurements of the sulfur concentration at two measuring stations in Voelklingen (city hall and fire department) and one in Berus between April 1, 1970 and March 31, 1973, as well as those measured at the meteorological department in Saarbruecken between December 1, 1971 and March 31, 1973, are reported. The half-hourly average sulfur dioxide concentrations of the air were ordered according to statistical methods such as group frequency, and excess frequency. For evaluation of the degree of SO2 pollution the upper and lower emission parameters were calculated for every measuring station and every month of the measuring period. The admissible lower emission limit of 0.40 mg SO2/cu m was not exceeded in a single case. The admissible short-term (upper) emission limit of 0.75 mg SO2/cu m was exceeded at each of the three measuring stations for the period of one month. In Saarbruecken the highest concentration of 0.93 mg SO2/cu m air was measured in January 1973, in Voelklingen in November 1972, (0.76 mg), and in Berus in January 1971, (0.78 mg SO2/cu m).

39582 **APTIC NO. 62522**

Terakado, K. and H. Fukuda

A COMPARISON OF OXIDANT CONCENTRATIONS DETERMINED AT A MONITORING POINT IN TACHIKAWA AND AT A FIELD OF THE EXPERIMENTAL STATION LOCATED IN THE SAME AREA. *(Tachikawa sokutei-ten to noshi ho-jo sokuteichi no hikaku). Text in Japanese. In: Tokyo Nogyo Shikenjo Sokuho, p. 27, Feb. 1974.*

Air quality measurements wery taken in a field where crop damages due to oxidants have been previously recorded. Correlations between plant damages and air quality measurements in the past have utilized data collected at the air quality monitoring site, and data actually gathered at the point of crop damage was needed to validate previous conclusions. No significant differences appeared between the average 1-hour values gathered at both points between 9 am and 6 pm on 5 days in August and values taken at 9 am, noon, and 2 pm on 2 other days. Days in which the oxidant concentration exceeded 10 pphm in August and September showed a distinct predominance of south and south-southeast winds, and this data is necessary for correct calculation of the correlations. Since the differences between the oxidant concentrations are small, only when a southerly wind of less than 1 m/sec blew would the data gathered at the monitoring site lead to invalid conclusions. The two points are about 2 km apart with topographical differences.

39583 **APTIC NO. 62459**

Tokuyama Municipal Government (Japan)

A SURVEY OF POLLUTION IN TOKUYAMA CITY. *(Tokuyama-shi no kogai gaiyo). Text in Japanese. 68p., March 1974.*

The state of air, water, noise, solid waste, and odor pollution in Tokuyama up to 1971 is comprehensively reported. Complaints against pollution are 45.3% against odors, 27.7% against noise, and about 25% against air pollution. The maximum amount of settling particles over the years was 12.1 tons/cu km/mo in 1961. The amount decreased up until 1969, but the 1971 average is back to the 11.6 ton level. The sulfur dioxide level measured by lead dioxide reached a peak in 1969 at 0.61 mg SO2/100 sq cm/day, and was 0.042 ppm of the environmental level, which was close to the 0.05 ppm environmental standard. The 1971 average decreased to 0.03 ppm, as a result of the conversion of fuel to oil and high stacks. The city has 26 monitoring stations for SOx and 16 stations for settling particles. Three monitoring stations are connected by telemeters to the central Prefectural monitoring bureau in Yamaguchi. Monitoring stations check sulfur oxides, suspended particulates, oxidants, nitrogen oxides, carbon monoxide, wind direction and speeds, and settling particles. Examinations of respiratory disease morbidity, mortality, and schoolchildren s group examinations are regularly given.

39584 **APTIC NO. 62492**

Itami Municipal Government (Japan)

A SURVEY OF POLLUTION. *(Kogai no aramashi). Text in Japanese. 18p., April 1, 1974.*

A total of 101 complaints registered in 1972 in Itami comprised 32% against noise, 25% against soot, 14% against odors, 19% against water pollution, 4% against dusts, and 3% against gases. The level of sulfur dioxide in the environment has decreased considerably over the last several years. In 1970, the average was 0.044 ppm, and the 1971 and 1972 averages were 0.026 and 0.027 ppm, respectively. The ratio of annual daily averages conforming to the environmental standard of 0.04 ppm was 91.4% in 1972, and that of hourly averages less than 0.1 ppm was 100%. The carbon monoxide level in 1970 was 2.6 ppm, and 2.0 ppm in 1971 and 1972. The CO environmental level standard passed 100% for both the 8-hour average and the 24-hour average. The monthly averages of nitrogen dioxide levels ranged between 0.026 and 0.046 ppm in 1972, and only 7.3% of these measurements passed the 0.02 ppm of environmental standard. Ninety percent of the daily averages for suspended particulates conformed to the standard of less than 0.1 mg/cu m, and 99% of the hourly averages were less than the standard of 0.2 mg/cu m. The oxidant levels passed the standard of less than 0.06 ppm 95.3% of the time. Photochemical warnings were issued six times between May and October 1972, but no health damages were reported.

39585 **APTIC NO. 62504**

Nagoya Municipal Government (Japan)

THE STATE OF POLLUTION--A SURVEY OF THE CONDITIONS AND COUNTERMEASURES (1973). *(Showa-48-nen kogai no genkyo--kogai no jokyo oyobi totta taisaku no gaiyo). Text in Japanese. 162p., Feb. 1974.*

The 1973 investigations on pollution in Nagoya are reported. Air pollution, water pollution, noise, vibration, land settling, odors, and toxicity are some of the major topics. Air pollution investigations include pollution by sulfur oxides, settling particles, suspended particulates, carbon monoxide, oxidants, and nitrogen oxides; emission sources such as industries emitting soot and dusts, automobiles, and fuel consumption; sulfur oxides emission quantity; dust emission quantity; nitrogen emission quantity; regulations and municipal guidance; pollution prevention plans; complaints and countermeasures; photochemical smog control plans; monitoring networks and regulation enforcement; and various investigative methods are discussed. The results of air quality measurements are presented in graphs, tables, charts, and maps. Sulfur oxides measurements were taken by electroconductivity and lead dioxide methods. In all monitoring locations, air qualities were much better than 1972. No sample exceeded the previous standard of 0.05 ppm hourly annual average, but a considerable number of samples will still fail to pass the new standard for daily average of 0.04 ppm. Measurements by a relative spectrometer show a pattern of higher concentration in southern Nagoya with 120 ppm/m SOx, and about 60 ppm/m in the north. In some parts of the harbor area and industrial belt, the measurement was as high as 150 ppm/m, at the altitude of 300 m.

1973

39586 **APTIC NO. 62134**

Fujii, Masami, Shoji Kitamura, and Masaomi Kondo

DISTRIBUTION OF MERCURY AND ATMOSPHERIC MERCURY. *(Suigin no bunpu to taikichu no suigin ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 26:5-47, Nov. 1973.*

The air of Osaka city was sampled for 1 month to collect dust using 1.2 micron membrane filters and radiochemical analyses. The concentration of mercury was 0.0013 microgram/cu m in Niiya in Sakai city, 0.0011 in Kaicho in Sakai city, 0.0019 in Higashinari-ku in Osaka City, and 0.0022 in Nishiyodogawa-ku in Osaka city. Radiochemical analyses of mercury in dust in each place are presented. The concentration of mercury in dusts was 0.0015 microgram/cu m in area A in Kawasaki city, 0.0003 in Osaka airport, 0.0006 in Higashinari-ku in Osaka city, 0.0035 in area A in Tokyo airport, and 0.0045 in Omori in Tokyo. In 1972, the Environment Agency conducted an analysis of atmospheric mercury using a solvent collection method. The mercury concentration was 0.13 to 0.46 microgram/cu m in areas adjacent to the industrial areas of huge industrial cities and 0.013 to 0.045 in medium industrial cities. Analytical methods for mercury and the mercury pollution of soil are also described.

39587 **APTIC NO. 61665**

Gatz, Donald F.

AIRCRAFT FILTER SAMPLING AND ANALYSIS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 145-152, 1973. 8 refs.*

Chemical analyses and particle-size determinations were performed on aircraft filter samples collected during the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis, for the purpose of examining upwind/downwind differences as well as vertical differences in the particle size distribution and trace element concentrations. Relative comparisons between sampling locations showed that particle concentrations increase from upwind to downwind locations. No differences were apparent between particle concentrations at 610 m above the surface and surface stations having the same orientation with respect to pollution sources. Concentrations of trace metals at 610 m on August 13, 1971 appear to be reasonable in comparison with monthly means from St. Louis County surface stations, in view of the weather at sampling time.

39588 **APTIC NO. 61854**

Hishida, Kazuo

ONCE AGAIN, BLUE SKY IN TOKYO-ATMOSPHERIC SOX BACK TO THE LEVEL OF 1961-62. *(Aozora o torimodoshita Tokyo-to-taikichu no io sankabutsu wa 36-37 nen no jotai ni modoru). Text in Japanese. Haguruma (Cogwheels), no. 199:9-14, Jan. 1973.*

The average sulfur oxide concentration at eight locations in Tokyo increased from 0.036 [illegible] 1963 to 0.054 ppm in 1967, but gradually decreased to [illegible] ppm in 1970 and 0.033 ppm in 1971. There has been no [illegible] warning issued since Dec. 18, 1970. In 1968, there were [illegible] wards which had an average SOx concentration over 0.05 ppm. The number decreased to six wards in 1970, but to only one ward in 1971. The air pollution control act issued in February 1968 was the factor that caused this change despite the fact that fuel consumption in Tokyo increased by 6% each year. Automotive exhaust gases are the major problems to be solved in the future.

39589 **APTIC NO. 62132**

Hishida, K., H. Nihei, K. Ikeda, U. Sano, I. Hayakawa, and K. Yanakawa

STUDIES ON AIR POLLUTANT EMISSIONS IN TOKYO. *(Tonai no osen busshitsu haishutsu jokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):370, 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The total emission of various pollutants in the Tokyo metropolitan area was calculated based on the emission coefficients obtained by the municipal government through field investigation. A one square km block was used as a basic unit (with Long. 139 degrees 50 minutes E. and Lat. 40 degrees N.) as the upper limit. The total emission from moving sources was calculated from the numbers of acutally running vehicles instead of the numbers of registered vehicles, and the calculation was based on the accumulation of a large number of blocks. The total emission of sulfur oxides from fixed sources in 1972 was 78,036 tons or 95.6% and that from moving sources was 3,563 tons or 4.4%, that of nitrogen oxides was 29,906 and 66,458 tons, that of carbon monoxide was 31,744 and 561,477 tons, that of hydrocarbon was 72,220 and 147,254 tons, that of soot was 21,796 and 1,029 tons, and that of aldehydes was 171 and 1,144 tons, respectively.

39590 **APTIC NO. 61749**

Inoue, K., K. Imamura, K. Oka, F. Go, K. Taguchi, N. Tajima, Y. Tsujino, Y. Nishkawa, H. Hatanaka, and Y. Yoshimura

INVESTIGATION OF PHOTOCHEMICAL SMOG IN FUJIIDERA. *(Fujiidera chiku ni okeru kokagaku sumoggu chosa). Text in Japanese. Osaka-fu Kogai Kanshi Senta Chosashitsu Kenkyu Hokoku (Proc. Res. Sect., Osaka Environ. Pollution Control Center), no. 4:1-40, Dec. 1973.*

Fujiidera City, an Osaka suburban town surrounded by the hills on the three sides like a horse shoe, has no large industrial plants within its 8.2 sq mi area, but there is the Sakai coastal zone of industrial plants about 14-16 km to the west and there are a few organic chemical plants in Kashiwabara City located to the east on the other side of the Ishikawa River which forms the boundary between the two cities. The automobile traffic is not as great as in urban Osaka. Of about 1600 photochemical smog victims reported in the entire Osaka prefecture in 1971, however, 173 were from Fujiidera. In 1972, there were 88 victims on May 11, 25 on May 12, and 13 on May 24, the latter two days having no advance warning of possible photochemical smog occurrence. The three-day total numbered 126 accounting for most of 133 victims reported for the entire Osaka area. An air pollution survey was therefore conducted in the city for two periods, one from May 29 to June 19, the other from July 5 to July 26, both in 1972. In this survey, ozone, intensity of ultra-violet rays, intensity of visible rays, nitrogen oxides, sulfur dioxide, aldehyde, wind direction, wind velocity, temperature, and humidity were all measured. Values were tabulated by day and compared with those of the Osaka Environmental Pollution Control Center. The concentrations were evaluated in relation to the meteorological conditions.

39591 **APTIC NO. 62852**

Izumi, Takashi, Ryu Aizawa, Shinji Sato, and Kazuhiko Taira

LEAD CONCENTRATION IN THE ATMOSPHERE OF A MEDIUM-SIZE CITY. *(Chutoshi ni okeru taikichu enryo no jittai). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):93, April 1973.*

The lead pollution in a medium size city was investigated by air quality measurements at 24 locations in Nagasaki, and their relationships with the amount of traffic were studied. Tape air samplers and atomic absorption spectrophotometry were used. Measurements were recorded every hour for 24 hours. The average lead quantity at each point was slightly different depending on the area, road, and weather conditions, but generally high counts were noted during the morning rush hours and higher during the day than night. For any time segment, the degree of pollution paralleled the amount of traffic. The hourly lead average at a busy intersection was 2.04 micrograms/cu m from 7 to 10 am, while two other types of less busy areas had 1.25 and 0.98 micrograms, respectively. Between 8 pm and 7 am, the averages were 1.27, 0.94, and 0.59 micrograms at these three locations; 12-hour averages from 8 am and 8 pm were 1.66, 1.26, and 0.92; and 24-hour averages were 1.46, 1.09, and 0.79. In areas with relatively limited traffic, pollution from the center of the city seemed to diffuse and affect the lead content. Comparisons of lead levels on a sunny day and a rainy day at the same location showed the effect of washout by the rain. The average for the sunny day was 1.58 micrograms/cu m and 1.03 micrograms for the rainy day.

39592 **APTIC NO. 62123**

Kitamura, T., T. Ogura, M. Kanematsu, M. Kondo, K. Takeda, K. Yoshizumi, and S. Kondo

SURVEY ON ODOR POLLUTION IN TOKUSHIMA PREFECTURE (NO. 1) -- MEASUREMENT OF HYDROGEN SULFIDE. *(Toshishima-ken ni okeru akushu no chosa (No. 1) -- Ryukasuiso nodo no sokutei kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:63-74, May 1973.*

In 1972 Tokushima prefecture investigated odorous emission sources, especially hydrogen sulfide discharged from a spinning factory, a rayon factory, and a cellophane factory in the Imagiri industrial area in the eastnorthern part, and a kraft pulping industry in Anan city south of the Tokushima prefecture in order to set up the emission standard of the prefecture. The investigations were made by gas chromatography using a flame photometric detector (FPD), together with an automatic measuring method using lead acetate tape. The maximum concentration of hydrogen sulfide detected in the vicinity of the cellophane factory was 0.334 ppm. In and around the kraft pulp manufacturing factory, the odors of not only hydrogen sulfide but also methyl mercaptan and methyl sulfide were strong. No relationship between the hydrogen sulfide concentration and the odor intensity was recognized, and the concentration was about 1/10 to 1/100, 0.002 to 0.004 ppm, that of the rayon and cellophane factories. This is due to the fact that the rayon and cellophane factories in the Imagiri industrial area discharge the hydrogen sulfide from 45 m stacks, while the kraft pulp factory discharges it from 80 m stacks. Tokushima prefecture has set the emission standard of hydrogen sulfide to 0.05 ppm.

39593 **APTIC NO. 62748**

Kolb, Walter

PARTICULATE SULPHUR CONCENTRATION IN GROUND LEVEL AIR IN NORTH GERMANY AND NORWAY. *Physikalisch-Technischen Bundesanstalt Rept. 17p., May 1973. 6 refs.*

NTIS: PTB-Ra-3

The particulate sulfur concentration in ground level air in North Germany and North Norway was determined. Samples of atmospheric dust were collected for several years at 1.5 m above ground in Brunswick and since Oct. 1970 in Tromso. The evaluated S concentrations and the percentage of S content in the inorganic dust and the concentration of inorganic dust itself are tabulated. The concentrations of particulate S and of inorganic dust at Brunswick are in the order of 2 micrograms/cu m and 20 micrograms/cu m respectively. The inorganic dust andd particulate S concentrations at Tromso are not only significantly lower than those of Brunswick, but vary seasonally. The percentage of S in the inorganic dust samples is not constant.

39594 **APTIC NO. 62601**

Matsumoto, Hiromi, Takashi Suminoto, Shigehiko Matsumoto, and Nobuaki Izumi

MONITORING AND MEASUREMNT BY AIR POLLUTION MONITORING VEHICLES. *(Kogai sokuteisha ni yoru kanshi sokutei). Text in Japanese. Kagoshima-ken Kogai Eisei Kenkyusho-ho (Rep. Kagoshima Prefect. Inst. Pollut. Pub. Health, no. 9:100-103, Aug. 1973.*

At 14 measuring points in nine cities in Kagoshima prefecture, concentrations of sulfur oxides, suspended particulates, and carbon monoxide were measured during 1972 by air pollution monitoring vehicles. Measurement of nitrogen oxides, hydrocarbons and oxidants at intersections of major highways was initiated at the end of the year. However, the data obtained were insufficient to be reported. The lowest, average, and highest values of SOx, suspended particulates, and CO are given. The SOx concentration measured by electroconductivity was higher at Kawauchi, Idemitsu, and Yakushima, which was attributed to industries in the area. However, the SOx concentrations were slightly below the environmental standard. The suspended particulates measured by the pulse method gave a fairly high average of 0.089 mg/cu m at Yakishima. Higher values at congested traffic area is probably attributable to dust raised by moving vehicles. The CO concentration was lower than the 10 ppm environmental standard at all points.

39595 **APTIC NO. 62602**

Matsumoto, Hiromi, Takashi Suminoto, Shigehiko Matsumoto, and Nobuaki Izumo

MEASUREMENT OF SULFUR OXIDES BY LEAD DIOXIDE METHOD. *(Nisankaenho ni yoru io sankabutsu no sokutei). Text in Japanese. Kagoshima- ken Kogai Eisei Kenkyusho-ho (Rep. Kagoshima Prefect. Inst. Pollut. Pub. Health), no. 9:97-98, Aug. 1973.*

The sulfur oxides concentration in Kushikino city was measured by the lead dioxide method. At five measuring points, the PbO2 test piece was left standing for 1 month. The sulfate ion of the lead sulfate produced was determined by the gravimetric method. Results are given in terms of mg SO3/day/100 sq cm PbO2. The SOx concentration at the center of the city was higher, which was attributed to higher population density. The seasonal trend of higher SOx concentration from fall to winter indicated the effect of heating in colder seasons. The overall pollutant concentrations were well below the environmental standard.

39596 **APTIC NO. 61875**

Miyamoto, Toshio, Toshiaki Watanabe, and Yayoe Tominaga

SULFUR OXIDES MEASUREMENTS (PBO2 METHOD) IN THE KASHIMA DISTRICT. *(Kashima chiku ni okeru io sankatutsu (PbO2 ho) ni tsuite). Text in Japanese. In: Ibaraki-ken Kogai Gijutsu Senta Kenkyu Hokoku. p. 34-42. July 1973. 1 ref.*

Sulfur dioxide measurements were conducted at 17 monitoring stations, centering on the petroleum complex area. Air was sampled by a standard British louvre sampler and SOx was analyzed by barium chloranilate colorimetry method. Results showed that the SOx concentration increased slightly from 1969 to 1972; the concentration was lower during the rainy season and typhoon season but higher during summer and winter; the concentration in summer was high in general, but in winter only those areas closed to the industrial complex had high concentration; no apparent relationship was found between the SOx concentration and wind direction in areas closed to the industrial complex.

39597 **APTIC NO. 61787**

Mizukami, Yukihiro

PREVENTING MEASURES TO AIR POLLUTION IN SAPPORO CITY. RESULTS OF OPERATION OF DISTRICT HEATING SYSTEM IN CENTRAL AREA OF THE CITY. *(Sapporo-shi no taiki osen boshitaisaku. Tokuni toshinbu chiikidanbo no unten jittsuseki ni tsuite). Text in Japanese. Doryoku (Nihon Doryoku Kyokai Kaiho) (J. Japan Power Assoc.), 23(126):418-426, 1973.*

The air pollution in Sapporo has been significantly reduced in the last several years. The amount of particulates deposited in the central area of the city was 18.0 ton/sq km/ mo in winter 1971 which was less than 30% that of 1967. The frequency of smog occurrence has also decreased from 47 times in 1956 to 11 times in 1969. The concentration of sulfur dioxide increased drastically in 1964 due to the change of fuel from coal to oil, however it has been decreasing again since 1968 and is below the environmental standard now in almost all of the city. The SO2 concentration in the central area measured by the lead dioxide method was 1.0 mg/day/100 sq m. The decrease is probably due to regulations to decrease the sulfur content of oil and to the partial operation of a district heating system in the central area that supplies 44 Gcal/hr to 22 buildings. The system will eventually supply 300 Gcal/hr to about 300 buildings in a 1.5 sq km area.

39598 **APTIC NO. 62170**

Odaira, Toshio

CORRELATION BETWEEN PRIMARY POLLUTANTS AND OXIDANT CONCENTRATION OF LOS ANGELES AND TOKYO. *(Ros Anzerusu to Tokyo no ichiji osenshitsu to okishidanto no sokan ni tsuite). Test in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):572, Oct. 1973. (Presented at the Japan Society of Air Pollution) Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 295.)*

Using data from the Los Angeles monitoring stations and Tokyo monitoring stations, the patterns of oxides, nitrogen dioxide, carbon monoxide and oxidant concentrations in two cities were studied. Generally, monthly averages of pollutants in Los Angeles are higher than those of Tokyo: oxidant concentrations are 4 pphm in L.A. and 2.8 pphm in Tokyo; NO is 4.8 pphm in L.A. and 6.2 pphm in Tokyo, NO2 is 6.3 in L.A. and 1.5 pphm in Tokyo; and CO is 4.2 ppm in L.A. and 3.7 in Tokyo. Early morning pollution is extremely high in L.A. The ratio of decreases in pollutant concentration on holidays is greater in L.A. than in Tokyo, but oxidant concentration shows no effect of weekends in both cities. The daily change patterns on 33 days of 1971 and 1972 when photochemical smogs occurred in Japan, four patterns of time changes were recognized. In all cases, the oxidant peak appeared about or shortly after noon. Type I had high concentration of NO and NO2 in early morning (between 6 and 10 am), Type II had no NO or NO2 concentration, Type III had a relatively high NO2 in the morning, and Type IV had a relatively high NO in the morning. The L.A. types are overwhelmingly I, compared to the predominance of type II for Tokyo. There are a limited number of types II and III but no type IV. In L.A. oxidants and other pollutants show relatively high correlation with time lag; there is a very low correlation in Tokyo.

39599 **APTIC NO. 61767**

Saendig, R. and R. Saendig

THE DETERMINATION OF SULPHUR DIOXIDE IMMISSIONS ON STATIONARY MEASURING STATIONS IN THE CITY CENTER OF ZWICKAU WITH THE AID OF ELECTRONIC DATA PROCESSING. *(Zur EDV-gestuetzten Bestimmung der Schwefeldioxid-Immissionen an einer stationaeren Messstelle im Stadtzentrum von Zwickau). Text in German. Z. Ges. Hyg. Grenzgebiete (Berlin), 19(12):890-896, 1973. 5 refs.*

On a stationary measurement station in the city of Zwickau 3,372 short-term and 771 long-term measurements of the sulfur dioxide emission concentration were taken over a period of 2 and one half years from 1966 to 1968. The short-term samples were taken every hour from 7am to 4pm with the exception of Saturday where the last measurement was taken at 12 noon. On Sundays no short-term meaurements were taken at all. The long-term measurements were taken by sampling for 24 hours through the weekend. Meteorological data such as wind velocity, direction, temperature and cloudiness were also recorded. All data were processed by computer In winter 1966/67 40% of the values exceeded the maximum allowable emission concentration of 0.5 mg SO2/cu m. High SO2 concentrations were rare. About 1% of all short-term measurement values obtained during the summer months were above 0.6 mg/cu m. During the heating period a maximum was found at 9am, another one between 5 and 7 pm. Nightly SO2 concentrations were on the average smaller than during the day.

39600 **APTIC NO. 61931**

Tomita, K., T. Kawaraya, and T. Haruki

THE AMOUNT OF POLYNUCLEAR AROMATIC HYDROCARBONS IN THE AIR IN OSAKA CITY. *(Osaka shi taiki chu takan tanka suiso ryo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10):625-632, Oct. 1973. 15 refs.*

The amounts of various hydrocarbons in effluent gas and in the environment surrounding them were measured by selecting auto exhaust and various factories as the source of various kinds of hydrocarbons including benzo(a)pyrene (BaP). At the time of deceleration and of idling, the amount of BaP (microgram/cu m) per the amount of effluent gas was high. The ratio of the amounts of various hydrcarbons to those of BaP (100) showed a remarkably high value compared to those in 20 (ghi) perylene (Bghi P) (175-300), coronene (Coro) (115-260), pyrene (Py) (208-861) and in urban atmosphere. At street intersections, and in garages, the amounts of hydrocarbons both show 1.5-2.0 times higher value than those in urban atmosphere. The amounts of BaP in environmental air at the different factories handling coke, tar, and pitch shows the highest value, more than 1800 microgram/1000 cu m, and follow gas factories, printing factories, and carbon factories. The ratios of various hydrocarbons to the amount of BaP (100) are described next; in the factories of gas, coke, tar and pitch, Bghi P (29-104), benzo(e)pyrene(BeP) (38-214), Coro (1-25), Py (82-943). Coro showed lower value than that in urban atmosphere or in auto exhaust. The ratio of Coro to BaP often changes. In general, auto exhaust is high.

39601 **APTIC NO. 62493**

Watanabe, Toshiaki and Yayoe Tominaga

SETTLING PARTICLES IN THE KASHIMA AREA. *(Kashima chiku no koka baijin). Text in Japanese. In: Ibaraki-ken Kogai Gijutsu Senta Kenkyu Hokoku, p. 59-67, July 1973.*

Settling particles in the Kashima area measured since 1968 at 15 measuring points are evaluated. Measured items are pH, total amount of settling particles, insoluble fraction, tar, ashes, iron, manganese, vanadium, soluble fraction, sulfate ion, nitrate ion, and chloride ion. Three-year average values from 1970 to 1972 are given in tabular form with diagrams showing regional characteristics. The yearly average total amount of settling particles showed slight increases in some locations and decreases in others without much fluctuation except in Takamatsu area. The insoluble fraction showed a similar trend. Higher total amount, insoluble fraction, iron, and manganese levels are shown in Takamatsu area where steel mills and related industries are located. Relationships between precipitation and settling particles were investigated, and a seemingly linear relationship was found between precipitation and soluble fraction.

39602 **APTIC NO. 62853**

Watanabe, Toshiaki, Yayoe Tominaga, and Gen Kobayashi

SUSPENDED PARTICULATES IN THE KASHIMA AREA. *(Kashima chiku ni okeru fuyu funjin). Text in Japanese. In: Ibaraki-ken Kogai Gijutsu Senta Kenkyu Hokoku, July 1973. p. 53-58.*

Heavy metal content in dusts at 4 monitoring stations in Kashima industrial area was measured. Air was sampled continuously for 24 hours from May 1971 to Dec. 1972, using a high volume sampler. The dust and its metal content were analyzed by atomic absorption method. The average dust concentration was 125 micro g/cu m, and the average iron manganese, lead, and cadmium concentrations were 3.66 microgram/cu m, 2.74 microgram/cu m, 0.13, microgram/cu m, and 0.004 microgram/cu m, respectively. The Fe content was directly related to the dust concentration while Cd content did not show any apparent relationship.

39603 **APTIC NO. 61826**

INVESTIGATION OF AUTOMOTIVE EXHAUST GAS POLLUTION IN MAIN CITIES OF FUKUI PREFECTURE. *(Kennai shuyoshi ni okeru jidosha haishutsu gasu ni yoru taiki osen chosa). Text in Japanese. Fukui-ken Kogai Senta Nenpo (Annu. Rep., Fukui Environ. Pollut.), no 2:43-51, Oct. 1973.*

Measurements of carbon monoxide, nitrogen oxides, suspended particulates, and lead in the air were taken in three major cities of Fukui Prefecture, Sabae, Fukui, and Tsuruga, at busy intersections. The measurements in summer of 1972 were compared to those of 1971, and all measurements in Fukui and Sabae were much lower in 1972. CO was measured by non-dispersive infrared automatic meter, NOx was measured by continuous NOx automatic meter, suspended particulates were captured by a hi vol sampler with glass fiber filter paper, and Pb contents were measured by atomic absorption spectrometry. The one hour average of an 8-hr continuous measurement of CO was 12.9 ppm in Fukui, 16.8 ppm in Sabae, and 11.2 ppm in Tsuruga, and all were well below the environmental standard of 20 ppm. The hourly average of 24-continuous hour measurements were also all below the standard of 10 ppm. The amount of nitric oxide decreased to a half in Fukui, but nitrogen dioxide doubled. The average amount of suspended particulates in Fukui was 276 micrograms/cu m as against 445.5 in 1971, in Sabae, 378.2 micrograms/cu m as against 406.7 in 1971. In Tsuruga, the amount increased from 219.3 to 480.8. The lead content decreased to 1/2 in Fukui and was 0.372 micrograms. In Tsuruga, the lead content in suspended particulates increased from 0.033 micrograms to 0.110.

39604 **APTIC NO. 61889**

Tokyo Metropolitan Government (Japan) Toshima District, Department of Construction Pollution

THE 1972 REPORT ON AIR POLLUTION INVESTIGATION BY THE ALKALINE FILTER PAPER METHOD. *(Arukari roshiho ni yoru taiki osen chosa hokokusho). Text in Japanese. May 1973. 21p.*

Measurements of sulfur dioxide and nitrogen oxide concentrations were conducted at 13 locations in the Toshima ward.

Filter paper treated with potassium carbonate was hung in the air at each location for one month. Sample solution was prepared by washing the filter paper with distilled water and titration of the resulting solution followed by treatments with sodium acetate- acetic acid buffer solution (pH 4) and barium chloranilate solution. The sulfur dioxide concentration was calculated from the absorbances of the solution and a standard solution measured at about 530 nm. A sample solution of nitrogen dioxide was prepared by treatments with sulfanilic acid solution and naphthylethylenediamine solution, and the absorbance of the sample solution as well as that of a standard solution was measured near 530 nm. The highest sulfur oxides concentration was found to be 0.47 mg sulfur trioxide/day/100 sq cm, which was due to heavy oil boilers for large buildings. The highest nitrogen oxides concentration was 0.092 mg NO2/day/100 sq cm.

39605 **APTIC NO. 62140**

Kumamoto Municipal Government (Japan), Pollution Control Section

INVESTIGATION REPORTS OF POLLUTION IN KUMAMOTO CITY. *(Kamamoto- shi ni okeru kogai chosa hokoku). Text in Japanese. Rept. 7, 131p., Oct. 1973.*

In view of the fact that the Kumamoto plains are liable to the formation of inversion layers from a topographical standpoint thus giving fear of air pollution, Kumamoto city has measured dust fall, sulfur oxides, and carbon monoxide in order to prevent air pollution caused by inversion layers, and in July 1972 included measurements for nitrogen oxides, all hydrocarbons, and oxidants. The dust fall has been measured since 1964 at six places in Kumamoto city, and the quantity of dust fall was decreasing; the lowest concentration was 6.8 tons/sq km/mo in 1972. The months of June and July, during which the amount of rainfall was high, had higher dust fall values. November and December had less rainfall and lower concentrations. Kumamoto station had the highest dust fall values, 7.62 tons/sq km/mo and Kayamatoshima agricultural cooperative association has the lowest ones, or 4.94 tons/sq km/mo. The concentration of floating dust measured by a digital dust meter was, on the average, 0.032 mg/cu m in 1972, and the environmental standard was exceeded only on 5 days in both January and February during a temperature inversion. The concentration of sulfur oxides measured by the lead dioxide method was the highest, 0.71 mg, in front of Kumamoto station, and the yearly average of those measured by the conductivity method was 0.025 ppm. The maximum daily average was 0.032 to 0.055 ppm.

39606 **APTIC NO. 62224**

Environmental Protection Agency, Research Triangle Park, N. C. Office and Air Quality Planning and Standards and Environmental Protection Agency, Research Triangle Park, N. C., Division of Stationary Source Enforcement

STATE AIR POLLUTION IMPLEMENTATION PLANT PROGRESS REPORT JANUARY 1 TO JUNE 30, 1973. *Rept. EPA-450/2-73-005, 171p., Sept. 1973. 18 refs.*

NTIS: PB 230 909/AS

Significant activities related to State Implementation Plans are summarized for the semiannual period ending June 30, 1973. A significant nationwide total suspended particuate (TSP) air quality problem exists according to results of TSP monitoring in 1972. Data indicate that sulfur dioxide presents much less of a problem than TSP. The national monitoring of oxidants is substantially less than for TSP and SO2, but shows a significant oxidant problem. The nitrogen oxides measurement technique is currently being re-evaluated by EPA. Air quality has improved substantially over the past decade with respect to TSP and SO2. Annual averages of TSP have improved by over 20% during the past 12 yr while SO2 has improved 50%. Nationwide trends in oxidants, carbon monoxide, and NOx are not yet identifiable, but, based on analysis of NOx data from six sites, CO and oxidant concentrations appear to be decreasing. The estimated emissions for SO2, particulate matter, CO, hydrocarbons, and NOx from major source categories are summarized and include transportation, fuel combustion in stationary sources, industrial processes, solid waste disposal, and miscellaneous. Enforcement procedures are discussed. (Author summary modified)

39607 **APTIC NO. 62490**

Chiba Prefecture Environmental Protection Research Inst.

THE NATIONAL AIR POLLUTION MONITORING NETWORK-ICHIHARA MONITORING STATION MEASUREMENTS REPORT. *(Kokusetsu taiki osen sokuteimo - Ichihara sokuteijo sokutei kekka hokokusho). Text in Japanese. Rept. 3, 148p., March 1973.*

The measurements of air quality taken in Ichihara city as part of the national air pollution monitoring network for 1972 through March 1973 are presented. The total monthly averages over these months were 0.018 ppm for sulfur oxides, 0.013 ppm for nitric oxide, 0.022 ppm for nitrogen dioxide, 0.03 mg/cu m for suspended particulates, and 0.8 ppm for hydrocarbons. Seasonally, SOx levels were high in winter (0.035 ppm average), and low in winter (0.009 ppm), and NOx levels are high in fall and winter (0.034-0.031 ppm). The highest monthly levels for suspended particulates were 0.51 mg/cu m in December 1972; total HC, 3.9 ppm in October 1972; 0.140 ppm for NO2 in Dec. 1972; and 0.022 ppm for NO in February 1973. In general, the yearly levels of SOx and NOx for 1972 were slightly higher than those of 1971 and about the same as those of 1970. Seasonally the levels of pollutants are higher in fall and winter, and SOx and NOx measurements were high from Dec. 1972 to March 1973 in all wind directions, whereas the levels increased with west northwest winds in 1970 and 1971. Over 3 years, the measurements of sulfur oxides recorded by automatic recorder and lead dioxide showed extremely high correlations. The SOx and NO2, SOx and NO, and NO2 and NO showed high correlations and SOx and total HC showed can inverse correlation.

1972

39608 **APTIC NO. 62063**

Bujak, J.

ATMOSPHERIC AIR POLLUTION IN THE OJCOW NATIONAL PARK. *(Zanieczyszczenia powietrza atmosferycznego na terenie Ojcowskiego Parku Narodowego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(1):1-7, 1972. 3 refs.*

NTIS: TT 72-54023/1

Due to the drying of trees in the Ojcow National Park in Poland, pollutants in the air of the region were measured. Both dust deposits and sulfur dioxide concentrations exceeded permissible standards at various measurement sites. Tentative results were consistent with observations made by the Park authorities regarding the impressive damages suffered by the forest within different parts of the terrain. The possibility of surrounding the Park with a green belt of trees resistant to SO2 should be studied.

39609 **APTIC NO. 62065**

Maj, U.

MEASUREMENTS OF SULFUR DIOXIDE CONCENTRATIONS IN THE ATMOSPHERIC AIR OF KATOWICE. *(Pomiary stezen dwutlenku siarki w powietrzu atmosferycznym miasta Katowic). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):8-14, 1972. 4 refs.*

NTIS: TT 72-54023/2

Two-year measurements of the levels of sulfur dioxide the air of Katowice-Muchowiec and Chorzow are reviewed. Atmospheric conditions affected the levels of SO2 discharged by industrial sources in the areas. Monthly SO2 concentrations were icreased in the winter due to heating. Concentrations of SO2 were highest in the morning. Sulfur dioxide levels were correlated with rainfall, atmospehric temperature, and wind. Analyses of the wind roses showed no clear interdependence between concentrations and wind directions.

39610 **APTIC NO. 62829**

Maj, U.

MEAN DAILY MEASUREMENTS OF DUST CONCENTRATION IN THE ATMOSPHERIC AIR OF KATOWICE CITY. *(Pomiary sredniodobowych stezen zapylania w powietrzu atmosferycznym miasta Katowic). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(5-31):9-14, 1972. 2 refs.*

NTIS: TT 72-54023/5

Mean monthly temperatures and total monthly precipitation values are reported for two monitoring sites in Poland in an effort to explain increased dust concentrations at both sites from one annual dust monitoring to a second one. The data indicate a striking reduction in the sum total of precipitation during the second monitoring period. Cumulative distribution functions for dust concentrations in the atmosphere at both monitoring sites are graphically illustrated along with tabulated mean monthly temperatures and total monthly precipitation.

39611 **APTIC NO. 61943**

Mitani, Kazunori, Michio Hoshino, Hironobu Tsuchiya, Kyoto Itaya, and Masato Kondo

STUDY CONCERNING EFFECTS OF AIR POLLUTANTS ON INDOOR ENVIRONMENT: 3RD REPORT, INVESTIGATION OF ACUTAL STATE AND MEASURING METHODS OF INDOOR POLLUTION. *(Taiki osen busshitsu no shitsunai kankyo ni oyobosu eikyo ni kansuru kenkyu: Dai-sanpo, Shitsunai osen no jittai to sokuteiho ni kansuru kento). Text in Japanese. Nagoya Eisei Kenkyoshoho (Rep. Nagoya Inst. Public Health), no 19:101-107, Oct. 1972.*

Both the indoor and outdoor concentrations of nitrogen dioxide, sulfur dioxide, hydrogen sulfide, carbon disulfide, carbon monoxide, carbon dioxide, lead, and dust were measured simultaneously to investigate the actual state of indoor pollution. Thy air cleaning efficiency of air filters was examined experimentally at the same time. Concentrations of SO2, Pb, and dust were lower indoors than outdoors. The reduction rates due to the air filters were 60.5% for SO2, 43.9% for Pb, and 44.1% for dust. Hydrogen sulfide and CS2 were lower indoors, but the reduction rates were not as great as for SO2. Nitrogen dioxide and CO were higher indoors than outdoors. This is attributed to smoking by the occupants. The concentrations of these two pollutants were higher on the first floor than on other floors, a fact attributable to automobile exhaust being let in through the doors as people enter and leave. The indoor CO concentration sometimes exceeds the environmental standard of 10 ppm on the first floor. The efficiency of adsorption by glass fiber filters of SO2 and NO2 was 73% and 22.7%, respectively. This indicates that an ordinary dust-removing filter alone cannot remove NO2 effectively. A digital dust meter and a Duster 2000 dust meter were used in a comparative study. The former indicated values twice as great as the latter. The difference was due to different sensitivity to cigarette smoke.

39612 **APTIC NO. 62186**

Pott, F. and A. Brockhaus

CARCINOGENIC SUBSTANCES. *(Kanzerogene Stoffe). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung, p. 41-53, 1972. 39 refs.*

Studies on the occurrence and on the carcinogenic effect of benzo(a)pyrene and asbestos fibers in the air are reviewed. Benzo(a)pyrene, generated in incomplete combustion processes, is produced predominantly by domestic heating equipment (85.2% of the total emission), while the respective contributions by electricity generation, motor vehicles, waste incineration, and the petroleum industry are 0.1%, 4.3%, 1.0%, and 3.9%. The benzo(a)pyrene concentrations measured in New York City, Detroit, and other big cities in the USA were in the respective ranges of 0.1-9.4 nanograms/cu m, 0-17.0 nanograms/cu m, and 0.2-34.0 nanograms/cu m, compared to concentrations of 10.0-388.0 nanograms/cu m in Hamburg, 1.0-147.0 nanograms/cu m in England, 3-150 nanograms/cu m in Milan, and 17-141 nanograms/cu m in Budapest. The predominant role of domestic heating equipment in the formation of benzo(a)pyrene emissions is also demonstrated by the considerable difference between the concentrations measured during the winter and summer periods (6.3-382.2 nanograms/cu m in winter, and 0.8-28.8 nanograms/cu m in summer, as measured in Germany). Asbestos, especially crocodylite, chrysotile, anthiphyllite, and amosite, are highly carcinogenic when inhaled. The carcinogenic effect of these fibers is due to their inherent shape rather than to the presence in or on them of various carcinogenic chemical compounds, such as benzo(a)pyrene, chromium, nickel, or manganese. It was not possible to increase the carcinogeneicity of chrysotile fibers by the addition to them of benzo(a)pyrene. On the other hand, tumors were induced also by fine glass fibers and nemalite fibers.

39613 **APTIC NO. 62041**

Zimmerman, John

THE NATO/CCMS AIR POLLUTION STUDY OF ST. LOUIS, MISSOURI. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. IV-1-IV-15. 7 refs. (Oct. 2-3.)*

Results of a North Atlantic Treaty Organization/Committee on the Challenges of Modern Society air pollution study for the city of St. Louis are presented and compared with results of a similar study for Ankara, Turkey. Measured air pollution concentration is lower for St. Louis than for Ankara, despite the fact that the St. Louis region emits more total pollution, due to the combination of greater emissions from ground level pollution sources in Ankara and greater frequency of occurrence of extremely light wind speeds in Ankara. The median wind speed range for St. Louis is 7-10 mph as compared to 0-3 mph for Ankara. The observed concentration for sulfur oxides over St. Louis was found to be equal to 0.90 times the calculated concentration plus 9 micrograms/cu m, while that for particulates was equal to 0.47 times the calculated concentration plus 49 micrograms/cu m. The highest concentration of sulfur oxide appeared in the industrial East St. Louis area with winter values above 250 micrograms/cu m. Analysis of seasonal data indicated that particulate matter values (higher in the winter) do not change as greatly from summer to winter in St. Louis as they do in Ankara. A projected 1990 pattern of annual St. Louis particulate matter showed the effect of a reduction of about 30% in total annual particulate matter emissions, largely due to the elimination of coal as a heating and commercial fuel combined with the use of 99% efficient particulate matter control devices.

1971

39614 **APTIC NO. 62349**

Creason, J. P., O. McNulty, L. T. Heiderscheit, D. H. Swanson, and R. W. Buechley

ROADSIDE GRADIENTS IN ATMOSPHERIC CONCENTRATIONS OF CADMIUM, LEAD, AND ZINC. *Missouri Univ., Columbia, Trace. Subst. Environ. Health, Proc., Univ. Mo. Annu. Conf., 5th, Columbia, Mo., 1971, p. 129-142. 16 refs. (June 29-July 1.)*

Dustfall and suspended particulate pollutants were sampled at four sites within metropolitan Cincinnati, Ohio to determine whether motor vehicles are a source of atmospheric cadmium, lead, and zinc pollution. Data were collected during July, Aug., and Sept. 1968. At these sites, significantly higher concentrations of total dustfall, dustfall (settleable) Pb, and suspended Pb particulates were found 25 ft from the roadway than were found at 100 ft. Dustfall Zn concentrations did not differ significantly with distance from the roadway. Average dustfall Cd values displayed no obvious pattern that would indicate a specific source. Average site values, for the other metals, indicated industrial areas as possible suspended Cd sources, and the automobile as a probably major source of total dustfall, dustfall Pb, and suspended Pb. (Author abstract modified)

1970

39615 **APTIC NO. 61670**

Ferrara, R. and G. Tonna

AIR IONIZATION MEASUREMENTS UNDER DIFFERENT METEOROLOGICAL AND ENVIRONMENTAL CONDITIONS. *(Misure di ionizzazione dell aria in differenti condizioni meteorologiche e ambientali). Text in Italian, Istituto di Fisica dell Atmosfera, Rome (Italy) IFA-CP- 225 9p. 1970. 5 refs. (Presented at the Italian Geophysics Association, 18th Convention, Naples, Italy, Oct. 1-4, 1969.)*

Results of large and small ion concentration measurements performed in open country air, in polluted urban air in Rome, in artificial fog, and in air-conditioned spaces are presented. The respective concentrations of the large ions, positive small ions, and of negative small ions in nonpolluted country air were 40,000/cu cm; 640/cu cm, and 400/cu cm. The corresponding concentrations obtained during nighttime measurements were 2500/cu cm; 1200/cu cm, and 800/cu cm. The large ion and positive and negative small ion concentrations in polluted urban air were 80,000/cu cm; 300/cu cm and 200/cu cm, respectively. The high concentration of large ions was due to automotive exhaust emissions. The large ion concentrations reached 130,000/cu cm during peak traffic. In artificial fog with an initial condensation nuclei count of 20,000/cu m, the rate of small ion formation was about 200/cu cm and sec, compared with 10/cu cm and sec in nonpolluted country air and with 20/cu cm and sec in urban air. In air-conditioned spaces with persons present, the positive and negative small ion concentrations were about 500/cu cm and about 650/cu m, respectively. Particles associated with respiration, dust suspended in the air due to motion, and cigarette smoke were the chief sources of the condensation nuclei.

1967

39616 **APTIC NO. 62674**

Morton, D. J., A. M. Cantwell, and D. J. Fieldhouse

ATMOSPHERIC OXIDANTS ON THE DELMARVA PENINSULA, MAY-SEPTEMBER, 1966. *Plant Disease Reptr., 51(6):493-495, June 1967. 3 refs.*

Mast ozone analyzers at Newark and Georgetown, Delaware, and ozone-sensitive tobacco plants at Newark, Dover, and Georgetown, Delaware, at Salisbury, Maryland, and at Painter, Virginia, were used to detect the presence of oxidants on the Delmarva Peninsula. Oxidant levels at Newark and Georgetown frequently exceeded 0.05 ppm. Tobacco plants at all locations developed leaf symptoms suggestive of ozone but not of peroxyacetyl nitrate injury. Oxidant levels at Newark were correlated with local wind directions during daily periods of oxidant accumulation. On 35.7 and 57.9% of the days when oxidant levels equaled or exceeded 0.5 and 0.07 ppm, respectively, winds were from the west-southwest octant; on only 20.4 and 19.4% of the days when oxidant concentrations remained less than 0.05 and 0.07 ppm, respectively, did the winds blow from this direction. Other daily meteorological factors correlated with high and low oxidant levels, including barometric pressure (no appreciable differences), maximum temperatures (11.4 F higher when oxidant levels were high), and sky cover about 42% less when oxidant levels were high). (Author abstract)

ATMOSPHERIC INTERACTION

1974

39617 **APTIC NO. 61750**

Brunner, Frederick A. and Karl B. Schnelle, Jr.

AIR POLLUTION PATTERNS IN AN URBAN STREET CANYON. *Proc. Am. Soc. Civil Engrs. J. Environ. Eng. Div., 100(EE2):311-323, April 1974. 3 refs.*

Carbon monoxide sampling, temperature and wind sampling plus data processing, and traffic counts were performed in a typical urban street canyon located in Nashville, Tennessee in an effort to measure and record the vertical, lateral, and longitudinal distribution of carbon monoxide over the urban roadway, to examine and define by mathematical and statistical models the interactions of micrometeorological and source conditions over the roadway during periods of slight atmospheric dispersion, and to present the rationale and field sampling methodology in sufficient detail for future researches. A stepwise multiple linear-regression statistical method was used to analyze the multivariate data file. An understanding of the elevated carbon monoxide concentration buildup was gained as a further result of the carbon monoxide concentration and meteorological variable analysis. The CO concentration was generally lower in the 24-foot level than at the 18-foot level throughout most daily sampling periods and occurred at the higher level about 1/2 to 1 hr ahead of the 18-foot level buildup. The buildup broke up in the same order, occurring from the top down. During the time of highest CO readings, the CO concentrations were uniform throughout the level but built up and broke in cellular fashion.

39618 **APTIC NO. 62799**

Camps, M. and G. Bonometti

POLLUTION MODEL FOR THE LACQ INDUSTRIAL AREA. *(Modele pour la representation de la pollution sur le site de Lacq). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 13-1-13-10. (May 8-10.)*

The air pollution model of the Lacq industrial area is described on the basis of a pollution model obtained by analysis of the statistical distribution of the pollutant concentration with daily measurements obtained at the different sampling stations. Meteorological conditions were not initially considered. A regrouping of the concentration data into classes of equal amplitude permitted the determination of a beta type probability law for each sampling station.

39619 **APTIC NO. 62800**

Chrosciel, Stanislaw and Jan Juda

HYPOTHETICAL DISTRIBUTION OF THE SULFUR DIOXIDE AND SULFURIC ACID CONCENTRATIONS FOR A PUNCTIFORM SULFUR DIOXIDE EMISSION SOURCE (SUMMARY). *(Distribution hypothetique des concentrations de SO2 et de H2SO4 pour une source ponctuelle d emission de SO2. (Resume)). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 14-1. (May 8-10.)*

Based on the studies by Benarie, the transformation of sulfur dioxide into sulfuric acid in the course of atmospheric dispersion has been introduced in the formula for SO2 dispersion from punctiform SO2 emission sources. The new formula permits examination of the hypotheses on the distribution of SO2 and H2SO4 from punctiform SO2 sources for various meteorological conditions.

39620 **APTIC NO. 62758**

Chylek, Petr and James A. Coakley, Jr.

AEROSOLS AND CLIMATE. *Science, vol. 183:75-77, Jan. 11, 1974. 12 refs.*

To determine the effects of atmospheric aerosols on the radiative heating of the earth-atmosphere system, the radiative transfer equation is solved analytically in the two-stream approximation. The sign of the heating is independent of optical thickness of an aerosol layer and the amount of heating approaches a finite limit with increasing thickness of the layer. Limitations of the two-stream approximation are discussed. (Author abstract)

39621 **APTIC NO. 62798**

Detrie, J. P. and R. Bouscaren

STACK HEIGHT CALCULATION IN FRANCE. *(Calcul de la hauteur des cheminees en France). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 12-1-12-17. 6 refs. (May 8-10.)*

The pragmatic stack height calculation method, adopted in France on the basis of a similar USSR method, is presented with respect to stacks emitting sulfur dioxide and dust. The height of stacks emitting dust and SO2 is calculated as a function of such parameters as the temperature difference between the emitted gas and the ambient air, the flue gas and dust or SO2 outputs, and the dust and SO2 concentrations at soil level. Also the number of stacks in the specific area is considered. This method is currently applied for stacks in cement works, waste incinerators, iron ore dressing plants, oxygen converters, and foundries.

39622 **APTIC NO. 62569**

Drivas, Peter J. and Frederick H. Shair

DISPERSION OF AN INSTANTANEOUS CROSS-WIND LINE SOURCE OF TRACER RELEASED FROM AN URBAN HIGHWAY. *Atmos. Environ., 8(5):475-485, May, 1974. 27 refs.*

Sulfur hexafluoride was used as a gaseous tracer in a quasi-instantaneous line source release by an automobile moving along an urban highway in Los Angeles. Concentrations at various locations from 0.4 to 3.2 km downwind of the highway were recorded at ground level as a function of time. The tracer data were used to test the validity of several theoretical models which can be used in predicting the dispersion from an instantaneous crosss-wind line source. The model based upon the semi-empirical turbulent diffusion equation, using a power-law vertical velocity profile and a power-law vertical eddy diffusivity profile, provided the best agreement with the data. Saffman's analysis using this model was found to more accurately predict the experimental results than the other models tested. These results apply only for an instantaneous cross-wind line source. (Author abstract modified)

39623 **APTIC NO. 61778**

Fukuoka, Saburo, Mitsuru Utagawa, Toshio Ohira, Hideo Oguri, Nobuaki Kadoya, Yoshio Saiki, Isamu Suzuki, Sadao Imichi, Kojiro Matsumoto, Tadashi Mogi, and Haruo Naito

EXAMINATION OF TRENDS OF LARGE AREA PHOTOCHEMICAL SMOGS. *(Kokagaku sumoggu koiki osen keiko no kento). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 5:19-31, March 1974. 3 refs.*

To study the trends of photochemical smog covering a large area, the heavy smog data of seven days in June, July, and August 1972 in the Tokyo Metropolitan area, Saitama, Chiba, and Kanagawa prefectures were analyzed. Maps for the ground wind currents, oxidant distributions, and oxidant fluctuations at each monitoring points were prepared. Times of sea breeze coming inland, the meeting places of sea and land breezes and the meeting places for sea breezes from Sagami and Tokyo Bays, high oxidant concentration locations, oxidant concentration peak time characteristics, and the duration of high oxidant concentration were studied. The atmospheric stability of the days of high oxidant pollution covering large areas, the upper and lower limits of inversions, and the thickness of inversions were studied. The characteristics of large area smog were as follows: the most important factors causing a large area pollution by oxidant was the stability of atmosphere and the amount of sunshine in the total Tokyo Bay and Sagami Bay areas. Locally, high oxidant tended to appear at the meeting places of sea and land breezes and the meeting places of sea breezes from the two bays. The stagnation of sea breeze front caused a long sustaining of high oxidant level in the area.

39624 **APTIC NO. 62042**

Hanna, Steven R.

METEOROLOGICAL EFFECTS OF THE MECHANICAL DRAFT COOLING TOWERS OF THE OAK RIDGE GASEOUS DIFFUSION PLANT. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., ATDL Contribution 89, 25p., March 1974. 17 refs. (Presented at the Cooling Tower Environment--1974 Symposium, College Park, Md., March 4-6, 1974.)*

The environmental effects of the mechanical draft cooling towers at the Oak Ridge (Tenn.) Gaseous Diffusion Plant were investigated in an interdisciplinary study. Potential environmental problems are local fogging and deposition of chromate carried from the tower in drift water. The major problem in modelling plume rise and dispersion at this site is how to account for the merging of the individual plumes from the 60 cells. Photography and deposition measurements were used to estimate the degree of plume merging at various distances from the towers. Models of visible plume length, fog frequency, and drift deposition were compared with observations. The towers dissipate about 2000 MW of heat. Downwash occurs about 40% of the time, when wind speeds exceed about 3 m/s. An elevated cloud forms about 10% of the time. The length of the visible plume, which is typically 100 or 200 m, is satisfactorily modelled if it is assumed that the plumes from all the cells in a cooling tower bank combine. The calculation of fog concentration is complicated by the fact that the moisture is not inert, but is taking part in the energy exchanges of a thermodynamic system. Calculations of drift deposition agree fairly well with observations. (Author abstract modified)

39625 **APTIC NO. 62053**

Hanna, Steven R.

METEOROLOGICAL EFFECTS OF THE COOLING TOWERS AT THE OAK RIDGE GASEOUS DIFFUSION PLANT: II. PREDICTIONS OF FOG OCCURRENCE AND DRIFT DEPOSITION. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., ATDL Contribution File 88, 40p., March 1974. 17 refs.*

The frequency of occurrence of fogs and the rate of deposition of chromate due to emissions from the cooling towers at the Oak Ridge Gaseous Diffusion Plant were calculated. When naturally occurring rain or fog is absent, it is predicted that the cooling towers will cause about 100 extra hr of fog/yr at distances of 100 to 200 m from the towers. The standard Gaussian plume model was used to make these predictions. No extra fog is predicted to occur under these conditions at distances greater than 2 km from the towers. Drift deposition was calculated using the Gaussian plume model for drops with diameters less than 200 micrograms. The trajectory approach was used for larger drops. The variation of vertical speed in the plume and the evaporation of drops are accounted for. Predictions of chromate deposition at distances from 10 m to 1500 m from the towers agree fairly well with observations during the June, 1973 experiment. Calculated average annual chromate deposition rates vary from about 20 micrograms/sq m sec at a distance of 5 m from the towers to .0001 micrograms/sq m sec at a distance of 20 km from the towers. A detailed summary of other significant findings is included. (Author summary modified)

39626 **APTIC NO. 62089**

Hanna, Steven R.

RELATING EMISSIONS TO AIR QUALITY IN TENNESSEE. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., ATDL Contribution File 90, 19p., March 1974. 5 refs.*

Average annual emissions of suspended particles, sulfur dioxide, and carbon monoxide from each of the 95 counties in Tennessee during 1970 are compared with observed air quality. Due to the location of air monitoring instruments close to large local sources, the readings of these instruments are found to be usually not representative of regional air quality. In order to adequately test regional dispersion models in Tennessee, it is necessary to install additional air monitoring stations that are not influenced by large local sources. The vaiations of county pollutant concentrations across the state are generally within a factor of three, while the variations of county pollutant emissions are generally over several orders of magnitude. The wind speed therefore strongly controls, the day to day background level of air pollution in the state. (Author abstract)

39627 **APTIC NO. 61886**

Hino, Mikio, Yoshikazu Mori, and Shinjiro Yoshikawa

PREDICTION OF ATMOSPHERIC POLLUTION BY KALMAN FILTER. *(Karuman firuta ni yoru taiki osen no yosoku). Text in Japanese. Doboku Gakkai Ronbunshu (Trans., Japan Soc. Civil Eng.), no. 224:79-90, April 1974. 15 refs.*

A general discussion is given for air pollution prediction by Kalman filter, and its application to some of the polluted areas in Japan are analyzed. An air pollution system was treated as a group of differential equations and the optimum system parameters were determined by the application of Kalman filter theory. Results of the pollution predictions at Kashima (Ibaraki Prefecture) and Mizushima (Okayama Prefecture) using data obtained in August 1970, showed that there is uncertainty of the parameters for the system (these parameters include the wind velocity component and diffusion coefficient when Fick's diffusion equation is used) and for highly accurate prediction, constant on-line treatment of pollution and meteorological data is required.

39628 **APTIC NO. 62688**

Holdeman, James D.

DISPERSION AND DILUTION OF JET AIRCRAFT EXHAUST AT HIGH-ALTITUDE FLIGHT CONDITIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Rept. NASA TM X-71451, 9p., 1974. 5 refs. (Presented at the American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 12th, Washington, D. C., Jan. 30-Feb. 1, 1974.)*

NTIS: N73-33743

A method is presented for estimating the dispersion and dilution of jet aircraft exhaust from aircraft passage through times on the order of weeks thereafter. In the near wake of the aircraft, the solution is that for round turbulent jets in a parallel flow. More rapid dispersion due to atmospheric effects begins when the scale dependent eddy viscosity becomes larger than the turbulent jet eddy viscosity. In the far wake region, the solution approaches that for scale dependent dispersion from a point source moving with the aircraft. Calculations are presented for supersonic aircraft at high altitude flight conditions. (Author abstract)

39629 **APTIC NO. 62865**

Kalpazanov, Y. and G. Kurchatova

MULTIREGRESSIONAL RELATIONSHIPS FOR THE STANDARDIZATION OF DUST CONCENTRATIONS IN THE AIR OF INHABITED AREAS. *(Multiregressionnyye zavisimosti normirovaniya zapylennosti atmosfernogo vozdukha naselennykh mest.) Text in Russian. Gigiena i Sanit., no. 3:88- 90, 1974. 9 refs.*

The multiple regression analysis of the relationships between the dust concentrations, air temperatures, relative humidities, and groud-level wind velocities measured in Sofia and a nearby small town in Bulgaria is described. The regression analysis permitted a standard equation of the different interdependent factors to be derived. Increased air temperature in the small town near Sofia resulted in increased dust concentration in Sofia, while the dust concentration in Sofia decreased with increasing temperature in that city.

39630 **APTIC NO. 62804**

Katz, Joseph L. and Philippe Mirabel

THE GENERATION OF AEROSOLS BY BINARY HOMOGENEOUS NUCLEATION. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Pollueces, 11th, Paris, France, 1974, p. 19-1-19-10. 6 refs. (May 8-10.)*

The rates of nucleation of liquid aerosols from the gaseous mixtures sulfuric acid plus water and nitric acid plus water at 25 C for various relative humidities (10-100%) and various activities of acid vapor are calculated using the Flood-Neumann-Doering-Reiss-Doyle theory of binary homogeneous nucleation. The activities of acid vapor needed for nucleation are 25 to 300 times smaller for H2SO4 + H2O than for HNO3 + H2O. This is due to the much larger free energy of mixing in the liquid phase for H2SO4 + H2O. Conversion from activities to actual pressures leads to concentrations of nitric acid which are much too high to be found under normal atmospheric conditions. On the other hand, the concentrations of H2SO4 vapor needed to nucleate droplets in the H2SO4 + H2O system are in the range of .00004 to .013 ppm, a concentration which can result from photooxidation of sulfur dioxide in the atmosphere. Calculations are made of the growth curves for H2SO4 + H2O droplets (radius versus composition) at various relative humidities from the critical size radius up to 1000 A radius, corresponding to nuclei large enough to serve as condensation centers for heterogeneous nucleation. The limitations of binary homogeneous nucleation theory at extremely low concentrations of one of the components are discussed. This theory becomes inapplicable if the actual vapor pressure of one component is below .000001 torr. (Author abstract)

39631 **APTIC NO. 62507**

Kitagawa, Tetsuzo

PHOTOCHEMICAL SMOG IN LOS ANGELES COUNTY AND ITS SOURCE. *(Rosuanjerusu chiiki no okeru kokagaku sumoggu to sono hasseigen). Text in Japanese. Preprint, Japan Inst. for Architecture, p. 21-22, 1974. (Presented at the Japan Institute for Architecture Symposium on Safety Engineering, 5th, Tokyo, Japan, June 20-21, 1974, Paper 11.)*

The Los Angeles-type smog had been previously explained as an accumulation of automotive emission gases in the lower mixed layer of the inversion layer which were transformed into oxidants by photochemical reactions. A recent investigation using airplanes revealed that many layers of highly concentrated oxidants existed in the upper inversion layer as a result of airplane exhausts which were directly emitted into inversion layers. The amount of an airplane engine exhaust is equivalent to that of 2000 automobiles. The density of automotive emission does not compare with that of an airplane, and since an automotive emission gas is immediately diluted by 10,000 times or more on any highway, its concentration in the inversion layer cannot be great. Therefore, if an airplane emission gas is not diluted, its concentration to that of an automotive emission is approximately 1000:1, and the ratio of photochemical reaction kinetics is 1,000,000:1. As the inversion layer moves from the shore inland, the lower part is removed by turbulence within the mixed layer, and high concentration oxidant pollution is brought to the ground surface.

39632 **APTIC NO. 62858**

Kitamoto, Asashi and Yoichi Takashima

TRANSPORT THEORY OF AEROSOL IN TURBULENT FLOW. *Bull. Tokyo Instit. Technol., no. 121:41-65, March 1974. 16 refs.*

A theoretical model describing the depositon rate of polydispersed aerosol particles through the turbulent boundary layer onto a depositon surface, where the effect of gravity is ignored is discussed. The transfer rate of particles was successfully estimated by introducing an effective eddy diffusivity of the particles which includes the influence of inertia. The particle deposition rate is dependent factors such as the mean diameter of particle, the geometric standard deviation of the size distribution, the shape of particles, the fluid velocity, and on the mean fluctuation velocity. This new model will cover consistently the turbulent transport processes from Brownian diffusion to dust transport. (Author abstract modified)

39633 **APTIC NO. 62658**

Knox, Joseph B. and Allen L. Williams

RAINOUT STUDIES AT LAWRENCE LIVERMORE LABORATORY (INTERIM REPORT). *California Univ., Livermore, Lawrence Livermore Lab., Atomic Energy Commission Contract W-7405-Eng-48 and Defense Nuclear Agency Contract IACRO-73-814, Rept. TID-4500, UC-41, 19p., Feb. 1972. 18 refs.*

NTIS: UCRL-51530

Rainout studies that are being conducted at Lawrence Livermore Laboratory are summarized. An improved technical basis for the assessment of rainout is being investigated to develop understanding of the basic physical interactions that control the processes and to assess more rigorously the potential hazards to man. Aspects of the work include a microphysical description of precipitation scavenging of the nuclear debris aerosol, progress in the numerical modeling of natural cloud systems and their interactions with nuclear debris aerosols, and investigations of possible means of controlling the rainout removal process. (Author abstract modified)

39634 **APTIC NO. 62869**

Kovygin, G. F.

CERTAIN PROBLEMS OF SUBSTANTIATING THE PERMISSIBLE DENSITIES OF SURFACE CONTAMINATION WITH BERYLLIUM. *(Nekotoryye voprosy obosnovaniya dopustimykh plotnostey zagryazneniya noverkhnostey berilliyem). Text in Russian. Gigiena i Sanit., no. 2:43-45, 1974. 1 ref.*

The permissible density of surface contamination by beryllium was studied with respect to the redispersion of the surface contaminant and to the resulting in-the-air concentration of beryllium. Ammonium fluoroberyllate and metallic beryllium dust with a particle size of 50 micron, a fan providing for an air velocity of 1.8 m/sec were used for the experiments. Inverse correlation between the redispersion index; i.e., the ratio of the in-the-air aerosol concentration to the surface density of contamination, and the surface density of contamination was established. The correlation coefficient decreased with increasing air velocity. The maximum allowable surface contaminations that cause no aerosol contamination exceeding the maximum allowable beryllium concentration were 0.9 and 0.7 mg/sq m for ammonium fluoroberyllate and metallic beryllium without air movement, and 0.4 and 0.2 mg/sq m at 1.8 m/sec air velocity.

39635 **APTIC NO. 62542**

Locatelli, John D. and Peter V. Hobbs

FALL SPEEDS AND MASSES OF SOLID PRECIPITATION PARTICLES. *J. Geophys. Res., 79(15):2185-2197, May 20, 1974. 15 refs.*

A new set of measurements of the fall speeds and masses of a wide variety of solid precipitation particles was obtained during the winter months of 1971-1972 and 1972-1973 in the Cascade Mountains of Washington. Particular attention was paid to the effects of riming, aggregation and density on the fall speeds and masses. Empirical expressions are given for the relationships between fall speeds and maximum dimensions and between masses and maximum dimensions for the particles studied. The results are compared with other experimental observations where they exist. (Author abstract modified)

39636 **APTIC NO. 62484**

Nakano, M.

ESTIMATION OF AIR POLLUTION CONTRIBUTION RATE AND ITS APPLICATION (II): THE APPLICATION TO SULFUR OXIDE MEASURE IN OSAKA CITY. *(Taiki osen kiyo-ritsu no suitei to sono oyo (2)-Osaka-shi ni okeru io sankabutsu taisaku eno tekiyo). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 48(2):55-65, Feb. 1974. 8 refs.*

Nishiyodogawa-ku and Konohana-ku in Osaka are the most sulfur dioxide polluted places in Osaka. The pollution contribution rate of each fixed emission source was estimated on the basis of simulation of diffusion of pollutants in the air. Effective height of chimney was calculated with Priestley s equation or Concowe s equation. Diffusion of pollutant was assumed to follow the normal distribution. The diffusion parameters were determined from the result of diffusion experiments using tracers in these areas. The equi-concentration map of SO2 in Nishiyodogawa-ku obtained from the simulation calculation agreed well with observation. The reduction rate of SO2 emission from each factory was decided from the result of simulation in order to reduce the yearly average concentration of SO2 in these areas to 0.05 ppm. In 1971, the yearly average concentration of SO2 was reduced to 0.06 ppm from 0.078 ppm in 1970. The equi- concentration map of SO2 in 1972 was also calculated by the simulation method.

39637 **APTIC NO. 62882**

Parker, W. J.

PHYSICAL MODELING OF THE LOWER ATMOSPHERE WITH INCIPIENT CLOUD FORMATION. *Environ. Res., 7(2):119-121, April 1974. 1 ref.*

Cloud formation can be simulated on a laboratory scale to study the environmental factors associated with precipitation, including the ice-nucleating properties of aerosol particles. The model simulates inversion conditions in the lower atmosphere, and provides a turbulence-free interface between two dissimilar gaseous phases, which permits studies of ionic and molecular diffusion between gases having different physical and chemical properties. The chamber consists of a 2-liter beaker with a portion of solid carbon dioxide inserted into the base of the beaker which is allowed to remain undisturbed and free from induced turbulence for a period of several minutes. (Author abstract modified)

39638 **APTIC NO. 62890**

Regener, Victor H.

DESTRUCTION OF ATMOSPHERIC OZONE AT THE OCEAN SURFACE. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A. (Vienna), 23(2): 131-135, 1974. 9 refs.*

A procedure is suggested for the evaluation of the reaction constant K of the destruction of atmospheric ozone at the earth s surface. The method is applicable when the ozone profile and the wind speed at a fixed level are measured simultaneously. A logarithmic wind profile is assumed. An application of this method to some of the ozone profiles recently published by Tiefenau and Fabian leads to K approximately equals 0.1 cm/sec at the surface of the ocean. This value, if confirmed by measurements at other locations, would require an upward revision of current estimates of the global flux of atmospheric ozone into the earth.

39639 **APTIC NO. 61775**

Rubin, Edward S.

THE INFLUENCE OF ANNUAL ETEOROLOGICAL VARIATIONS ON REGIONAL AIR POLLUTION MODELING: A CASE STUDY OF ALLEGHENY COUNTY, PENNSYLVANIA. *J. Air Pollution Control Assoc., 24(4):349-356, April 1974. 10 refs.*

The influence of year-to-year meteorological variations on the prediction of annual average ground-level pollutant concentrations was examined via case studies of Allegheny County, Pa. Twenty-two stability wind roses responding different averaging intervals of from 1 to 7 yr were used in the Air Quality Display Model to predict annual average sulfur dioxide concentrations in two multiple source sub-basins, and from two single point sources representing industrial and utility boiler stacks. The effects of annual meteorological variations were manifested by changes in the magnitude of peak concentrations, the location of peak concentrations, and the geographic distribution of pollutants. For fixed rates of emission, the annual peak average SO2 round-level concentration varied by an average of up to 33% of the highest values for point sources and 17% for sub-basin complexes. In both cases, there was relatively little change in the location of peak concentration, though occasional directional shifts were noted. In contrast, marked variations were noted in the geographic area exposed to annual average concentrations in excess of several selected values. In contrast, marked variations were noted in the geographic area exposed to annual average concentrations in excess of several selected values. To aid in regional planning, several methods were formulated which considerably reduced the uncertainty in predicting peak annual concentration for varying degrees of historical data on regional stability wind rose. These methods are especially applicable to analysis of control strategies directed at attaining annual ambient air quality standards which nominally must never be exceeded. (Author abstract)

39640 **APTIC NO. 62604**

Shimogata, S., K. Sugawara, and O. Yokoyama

WIND TUNNEL EXPERIMENT OF DIFFUSION OF EXHAUST GAS EMITTED FROM ROOF VENTILATOR OF LONG FACTORY BUILDING. *(Kojo kenoku haikito haishutsu gasu no kasusan fudo jikken). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 9(1, 2):62-70, Jan.-March, 1974. 7 refs.*

Wind tunnel experiments were performed to quantitively investigate the diffusion of exhaust emissions from the roof ventilator of a factory building, with the source of pollution being regarded as a finite line source. Maximum ground level concentration appeared at shorter downwind distances as compared to point source cases, and the rate of concentration decrease and plume width increase with distance were smaller for the line source. Ground level concentrations were higher when the axis of the line source was perpendicular to the wind direction as opposed to parallel wind cases. Horizontal plume width was independent of wind speed.

39641 **APTIC NO. 62805**

Stauffer, D., K. Binder, and V. Wildpaner

STRUCTURE OF BINARY SOLUTION DROPLETS: CONTINUUM THEORY AND MONTE CARLO SIMULATION. *Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 20-1-20-10. 26 refs. (May 8-10.)*

In the theory of gas-to-particle conversion for clean and polluted atmospheres, one important step is the nucleation of a very small aerosol out of the gas phase. This nucleation is called homogeneous heteromolecular nucleation if it involves at least two different vapors. To calculate the formation energy of a binary mixture droplet out of the gas phase in classical heteromolecular nucleation theory, one has to take into account that the concentration of the solution near the droplet surface can be different from the composition in the droplet interior (surface enrichment effect). This problem is solved in a simple picture where the composition varies spatially, but where one has a sharp liquid-gas surface. In a material-independent continuum theory, the variation of the composition is assumed to give a free energy contribution proportional to the square of the concentration gradient. The continuum theory resulted in a simple rule: one can take into account the surface enrichment effect on the droplet formation energy by using the standard formulas for a spatially homogeneous concentration and by evaluating the vapor pressures and the surface tensions at slightly different compositions. Except for large droplets, the results depend on the coherence lengths. In the Monte Carlo computer simulation, the results confirmed roughly the concentration profile predicted by the continuum theory. Thus, the continuum results might be applied even to situations like the Ising model simulation where the spatial variation of the concentration is neither very smooth nor very small, as required by the continuum theory. The droplet continuum theory is described and tested on the magnetic spin 1/2 Ising model by Monte Carlo methods. Results of similar calculations are given, but the specific results for Ising droplets without miscibility gap are not ready. (Author abstract modified)

39642 **APTIC NO. 61821**

Storebo, Per B. and A. Nelson Dingle

REMOVAL OF POLLUTION BY RAIN IN A SHALLOW AIR FLOW. *J. Atmospheric Sci., 31(2):553-542, March 1974. 15 refs.*

The plausibility of removing pollution by rain was investigated by theoretically examining a configuration with rain falling through a shallow flow of pollution loaded air. The pollution particles are made up of ammonium sulfate mixed with graphite. A numerical feedback technique was used for calculating the developments of the droplets having the particles as nuclei, as they pass over a 300 m high ridge under steady exposure to removal by raindrops. The development of state parameters for air and vapor, together with droplet sizes, temperatures, equilibrium humidities, and rate of removal over the distributions are discussed. Dissipation of kinetic fall energy for droplets is shown to affect droplet behavior. Removal of pollution from low level air by rain appears to be quite efficient. (Author abstract modified)

1973

39643 **APTIC NO. 61661**

Ackerman, Bernice

THE AIRFLOW PROGRAM IN METROMEX. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and*

Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 113-124, 1973. 9 refs.

Field operations and results of an airflow program in Metromex, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis are described. Focus of the airflow program was on defining the wind and thermodynamic fields in the boundary layer for estimation of the urban plume and fluxes into convective systems. Topics covered include: pibal procedures, radiosonde siting and procedures, data reduction techniques, nocturnal studies, analyses of fair weather days, and statistical analysis of time variations. Preliminary results from the studies indicate that the airflow can be significantly perturbed over the urban complex in the lower part of the boundary layer and that this perturbation may extend through much of the layer if the convection is intense. Statistical analysis suggests that the planetary boundary layer of air overriding the central city is more turbulent than elsewhere in the nearby surroundings.

39644 **APTIC NO. 62652**

Anderson, Gerald E.

A MESOSCALE WINDFIELD ANALYSIS OF THE LOS ANGELES BASIN. *The Center for the Environment and Man, Inc., Hartford, Conn., Environmental Protection Agency Contract 68-02-0223, Program Element 1A1009, Rept. EPA-650/4-73-001, CEM4121-01-490C, 120p., June 1973. 2 refs.*

NTIS: PB 231832/AS

The rationale, derivation, and use of a mesoscale windfield analysis as applied to the Los Angeles Basin are reported as part of a multi-phase effort of modeling ground level and/or three-dimensional air pollution distributions in the region. The windfield analysis described is specifically applied to 13 hourly periods from 5:00 am to 5:00 pm on September 29, 1969 and one period at 6:00 am on September 30, 1969. Computer printouts are illustrated for: the analyzed temperature field, the grid point values of the velocity potential, and the grid point values of the south and west wind components. Graphic displays generated with an SC4020 film writer are also reproduced and show wind vectors at the output grid points. The wind vectors are superimposed on topographic contours.

39645 **APTIC NO. 62623**

Becker, K. H. and U. Schurath

PHOTO-OXIDATION OF AIRCRAFT ENGINE EMISSIONS AT LOW AND HIGH ALTITUDES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 5-1-5-19. 19 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The photooxidation of aircraft engine emissions at low and high altitudes and its relation to the formation of smog are discussed. Aircraft engines emit hydrocarbons, carbon monoxide, and oxides of nitrogen in addition to the main combustion products, which are carbon dioxide and water. The hydrocarbons undergo atmospheric oxidation by reactions with ozone, atomic oxygen, and various radicals. At low altitudes atomic O2 and O3 production is initiated by the photodissociation of man-made nitrogen dioxide which is involved in complex chain reactions including radical intermediates of the hydrocarbon oxidation. At high altitudes, O3 formation by NO2 photolysis is negligible compared with the photolysis of molecular oxygen leading to the natural O3 production. In medium altitudes, both natural O3 and O3 from the photolysis of anthropogenic NO2 may be of importance depending on geographic and meteorological parameters. At ground level the photooxidation of hydrocarbons in the presence of nitric oxides can lead to smog formation, whereas at higher altitudes it may affect the natural O3 content of the atmosphere. The sulfur dioxides emitted from aircraft burning sulfur-containing fuel is converted to aerosols which affect the physical conditions of the atmosphere. (Author summary modified)

39646 **APTIC NO. 62625**

Brasseur, G.

CHEMICAL KINETIC IN THE STRATOSPHERE. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 7-1-7-13. 24 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The chemical kinetics occurring in the stratosphere are discussed with emphasis on nitrogen oxides chemistry. Ozone is produced by the photodissociation of molecular oxygen and can be destroyed by several reactions involving the nitrogen-hydrogen-oxygen atmosphere. In the lower part of the stratosphere, and for photochemical conditions, an important loss of O3 is due to the NOx reactions. Nitric oxide is formed in the stratosphere after dissociation of nitrous oxide by the excited oxygen atom O (superscript 1 D). The formation of nitric acid is possible by the presence of hydroxyl radicals. Therefore, a careful study of the hydrogen atmosphere is necessary. Water vapor, methane, and molecular H2 have an indirect influence on the O3 distribution in the stratosphere. Stratospheric chemical reactions may cause changes in the ultraviolet radiation affecting ground level atmosphere.

39647 **APTIC NO. 62051**

Brezonik, Patrick L.

TRANSPORT OF NITROGEN INTO LAKES. *In: Nitrogen Sources and Cycling in Natural Waters. Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences, Environmental Protection Agency Research Grant 16010-DCK, EPA 660/3-73-002, p. 21-37, 141- 155, July 1973. 194 refs.*

The airborne sources of nitrogen are discussed in a review of the transport of nitrogen into lakes. The concentration and forms of nitrogen in a lake at a given time are a product of input rates, of the interconversion reactions occurring within the lake, and the rates of loss via outflow, denitrification, and sediment deposition. The airborne sources include rainwater, aerosols, dust, leaves, and miscellaneous debris. The range of nitrogen and phosphorus in a lake caused by precipitation has been estimated in one study as .58 g/sq m lake area/yr for nitrogen and 0.44 g/sq m lake area/yr for phosphorus; and in another study as .18-.98 g/sq m lake area/yr for nitrogen and .015-.060 g/sq m lake area/yr for phosphorus. Rainfall has recently received attention as a source of nitrogen nutrients. Rainfall was a major source of nitrate and sulfate in certain Virginia and North Carolina streams. Extensive studies on rainfall and urban and rural runoff as nutrient sources were made in the Cincinnati, Ohio region. Cincinnati rainfall averaged more than 1 mg/l in total N2 and 0.24 mg P/l in hydrolyzable phosphate. Nitrogen concentrations in rainfall are highly variable. Both nitrate and ammonia occur in significant amounts, but the NH3 is usually higher. Total N2 concentrations frequently approach 1/mg N/l, and both natural and cultural sources are responsible.

39648 **APTIC NO. 61959**

Carlson, Toby N., Joseph M. Prospero, and Kirby J. Hanson

ATTENUATION OF SOLAR RADIATION BY WIND-BORNE SAHARAN DUST OFF THE WEST COAST OF AFRICA. *National Oceanic and Atmospheric Administration Environmental Research Labs., Boulder, Colo., Weather Modification Program Office, NOAA Technical Memorandum ERL WMPO-7, NHRL-106, 29p., Sept. 1973. 19 refs.*

Solar radiation was measured aboard a ship near the coast of West Africa in August 1972 using an upfacing Eppley pyranometer and Volz type sunphotometers. A simple radiative transfer model for solar irradiance (the broad band measurements) was used to compute an effective aerosol transmission for essentially cloud free conditions. The aerosol transmission values showed systematic variations with changes in atmospheric turbidity as measured with the sunphotometers. For a typical hazy day, the mean aerosol transmission was 0.86 (the equivalent of a Volz turbidity of approximately 0.30) and the net depletion of the solar energy due to Saharan dust was estimated to be about 100 lys/day. This amount of heat loss is comparable with the mean depletion of solar energy solely due to cloud cover in this region and suggests that Saharan dust reduces the solar heating of the ocean atmosphere system, but probably also decreases the net radiation cooling at mid levels. The angstrom turbidity coefficient calculated from two pairs of turbidity measurements, was very close to zero for the period, implying a neutral haze extinction. (Author abstract modified)

39649 **APTIC NO. 62097**

Castleman, A. W., Jr., H. R. Munkelwitz, and B. Manowitz

ISOTOPE AND CONCENTRATION MEASUREMENTS OF STRATOSPHERIC SULFATE. *Preprint, International Assoc. of Meteorology and Atmospheric Physics, 19p., Dec. 1973. 25 refs. (Presented at the International Conference of Structure, Composition, and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, 1st, Melbourne, Australia, Jan. 14- 25, 1974.)*

Trends in concentrations of sulfur 32/S34 isotopic ratio of the S component of stratospheric aerosols were investigated to assess the significance of various possible sources and to establish the contribution of in situ gas to particle reactions. Concentration and isotopic values underwent regular cyclic changes following a few major explosive volcanic eruptions. However, after the volcanic-induced perturbations subsided, the S34 enrichment of stratospheric aerosols collected in both hemispheres returned to a value of about 2.6%. The major pertubations to the low level persistent aerosol layer result from a few volcanic eruptions. Trends in S34 enrichment of aerosols sampled at progressively later times following an eruption provide clear evidence that the particles are continuously replenished by gas to particle reactions of the sulfur dioxide initially injected by the eruption cloud. The observed trends are consistent with a simple one-dimensional model which accounts for both transport and chemical reaction. During periods of comparative volcanic quiescence, the primary input to the later comes from a common equatorial source. (Author abstract modified)

39650 **APTIC NO. 62270**

Castleman, A. W., Jr.

NUCLEATION PROCESSES AND AEROSOL CHEMISTRY. *Preprint, Brookhaven National Lab., Upton, N. Y., 71p., Nov. 1973. 127 refs.*

The composition and chemical reactions of upper atmosheric aerosols are reviewed. In the populated areas of the troposphere, a large percentage of the aerosol population is composed of sulfates, with varying amounts of ammonium sulfate and sulfuric acid presumably being the most abundant form of the sulfur. Other major inorganic components are silicates, oxides of aluminum, iron, manganese, magnesium, calcium carbonate, and components of sea salts including potassium, sodium, their chlorides, and, to a lesser extent, carbonates and bromides. Organic compounds comprised of the photochemical reaction products of alpha and beta terpenes which emanate from large areas, are also constituents of tropospheric aerosols. Particles in both the tropical and mid-latitude stratosphere contain, SO4, silicon, Na, chlorine, nitrate, Mn, and Br, but no K or nitrite. Sulfate ions were the major single component. Of the stratospheric particles collected in the upper mid-latitudes, a maximum average of 13.4% of the sulfate was chemically combined as ammonium sulfate. Samples from the tropical and lower mid-latitudes failed to show any ammonium content. Systematic concentration measurements and isotopic ratio studies have provided strong evidence that these stratospheric sulfates do not originate from the troposphere, but rather are formed by the in situ oxidation of S-bearing gases. There is far less known about the nature, and even the existence, of particle layers above the stratosphere.

39651 **APTIC NO. 61655**

Cataneo, Robert

SURFACE MEASUREMENTS OF CONDENSATION NUCLEI AND RAINDROP DISTRIBUTIONS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 84-88, 1973.*

Data of raindrop distribution measurements in the St. Louis region are presented as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis. Diagrams are provided showing raindrop spectrometer locations and average raindrop distributions. Data analyzed from two locations to date indicate that a downwind urban-affected location has fewer, larger raindrops for similar rainfall rates, as well as generally higher rainfall rates, than a site located sufficiently far from the industrial area to be considered rural.

39652 **APTIC NO. 61666**

Cataneo, Robert

AIRCRAFT MEASUREMENTS AND OBSERVATIONS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 153-162, 1973.*

Data obtained from aircraft measurements and observations taken as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis, are presented in graphical form. Measurements are summarized for condensation nuclei, ambient temperature, wet bulb depression, cloud bases over the urban and surrounding rural area, updraft parameters, particulate sources in the St. Louis urban area, and general cloud structure characteristics in the region. Tracer materials used were a solution of lithium chloride which was burned as an aerosol and solid indium oxide flares.

39653 **APTIC NO. 61652**

Changnon, Stanley A., Jr.

METROMEX THUNDERSTORM STUDIES FOR 1971-1972. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 40-49, 1973. 2 refs.*

Space and time information on the occurrence of thunderstorms, as measured at seven sites in the St. Louis area during the June-August periods of 1971 and 1972, are presented as part of the Metromex study, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis. The frequencies of thunderstorms in the network, classified by geographic position, are presented for individual days, months, and season. Results on the time and duration of thunderstorm activity are also presented along with information on the synoptic weather types associated with the thunder occurrences. Diagrams are provided for isoceraunic patterns. There is a downcity increase in the number of thunderstorm days, number of discrete thunder periods, and durations of thunder periods. Synoptic weather studies indicate that thunder initiation related to the city occurs most often in air mass (non-frontal) conditions and is also quite prevalent in frontal zone (+ or - 50 mi of a front) conditions. The 1971-1972 results agree closely with those determined from earlier climatic studies using scantier data.

39654 **APTIC NO. 61653**

Changnon, Stanley A., Jr.

METROMEX HAIL STUDIES FOR 1971-1972. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 50-56, 1973. 5 refs.*

Data on the characteristics and frequency of hail, as measured at 222 sites in a circular network around St. Louis during the summers (June-August) of 1971 and 1972, are presented as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban St. Louis Area. The results indicate urban enhancement of the number of hail days, number (and area) of hailstreaks, and in the intensity of hail (stone sizes and energy). Urban-effect hail incidence is more than 200% greater than that in natural distribution. Typical urban-related hailstreaks are larger, longer-lived, produce more hailstones, have greater impact energy, and are associated with heavier rainfall than are hailstreaks which are not related to urban-effect raincells. Urban enhancement of hail is observed most often in squall conditions, although it is also apparent in frontal zone and air mass conditions.

39655 **APTIC NO. 62313**

Changnon, Stanley A., Jr.

SECULAR TRENDS IN THUNDERSTORM FREQUENCIES. *Preprint, American Meteorological Society, 7p., 1973. 13 refs. (Presented at the American Meteorological Society, Conference on Severe Local Storms, 8th, Boston, Mass., Oct. 15-17, 1973.)*

Thunder-day data was collected for 1901-1970 to determine changes in thunderstorms due to man-made climatic shifts. Trends of 5 to 15% decreases since 1935 occurred at most stations in the continental U. S. Decreases at several zones were statistically significant at the 5% probability level. This downward trend in North America was not found in Europe or the Pacific. In Europe, a slight upward trend began in the 1935-1950 period. The areal pattern of decrease in the U. S. showed the least decrease, 4.6% in the Rocky Mountains with the decreases becoming greater eastward, reaching 12.8% on the East Coast. Observational errors or omissions were unlikely explanations for the downward trends. It was unlikely that part of all of the downward trend was due to natural climatic fluctuation. Since fine-particle aerosols over the Atlantic Ocean have doubled in the past 60 years, it is possible that increased condensation nuclei for man s activities led to the decreases in rainfall and in thunderstorms. This is supported by the lack of change in aerosols and thunderstorms in the Pacific. The pattern of thunderstorm decrease in North America also suggests that the changes may be related to atmospheric pollutants. (Author summary modified)

39656 **APTIC NO. 62314**

Changnon, Stanley A., Jr. and Floyd A. Huff

ENHANCEMENT OF SEVERE WEATHER BY THE ST. LOUIS URBAN-INDUSTRIAL COMPLEX. *Preprint, American Meteorological Society, 8p., 1973. 14 refs. (Presented at the American Meteorological Society, Conference on Severe Local Storms, 8th, Boston, Mass., Oct. 15-17, 1973.)*

The 1971-1972 studies of thunderstorms in the St. Louis area showed a downcity increase in the number of thunderstorm days, the number of discrete thunder periods, and the durations of thunder periods. Synoptic weather studies indicated thunderstorm developments that are related to the city occur most often in air mass (nonfrontal) conditions and are also quite prevalent in frontal zone conditions. Many of the 1971-1972 results agreed closely with those determined from earlier climatic studies using scantier data. Certain facts such as the increase in morning frequencies of thunderstorms appear indicative of certain causes which may help support a thermal effect explanation. Thunderstorms in Chicago, New Orleans, and St. Louis occurred most frequently either in air mass, isolated convective situations, or in stationary frontal situations. These are frequently marginally unstable conditions with light wind fields and little organized convection. Thunder increases had a better relationship to urban pollutions and heat emissions than to particulate emissions. Thus, urban size and heat effects and mechanical turbulence are more important factors than urban-generated nuclei in producing thunderstorms and hail. Urban effects which produce vertical motions appear to be the primary urban mechanisms of added convective activity. The mechanical lifting factor is probably less important than the thermal factor in developing and intensifying convection, however. The study of hail data also indicated urban enhancement. The typical urban-related hailstreak was larger, longer-lived, produced more hailstones, had greater impact, and was associated with heavier rainfall than hailstreaks not related to urban-effected raincells. Urban enhancement of hail occurred most often in squall conditions. The distribution of heavy rainstorms was studied to determine effects of air pollution on intensification of rainstorms. Intensification of existing storm systems was probably the major cause of the observed highs in the two-summer rainfall pattern of 1971-1972. Intensification produced increased rainfall volume in storms of moderate to relatively heavy intensity, resulting in a highly abnormal number of 1-inch storms east of the Mississippi River. (Author conclusions modified)

39657 **APTIC NO. 62694**

Changnon, Stanely A., Jr.

INADVERTENT WEATHER AND PRECIPITATION MODIFICATION BY URBANIZATION. *Proc. Am. Soc. Civil Engrs., J. Irrig. Drain. Div., 99(IR1):27-41, March 1973. 10 refs. (Presented at the American Society of Civil Engineers, National Water Resources Engineering Meeting, Atlanta, Ga., Jan. 24-28, 1972.)*

Urban areas have altered all forms of weather in varying degrees. Inadvertent urban modification of precipitation apparently leads to annual precipitation increases of 5-30% over and immediately downwind of several American cities. These effects have also led to alterations in thunderstorm days with annual increases of 15-30% near several cities. Frequencies of days with greater than or equal to 2-inch rains were increased (due to urban effects) in and downwind of urban complexes by 20-40%. Runoff in the urban-rain effect areas has also increased by 15-20%. Ground water in certain geomorphic areas may also have been affected by these rain increases, since sizeable increases in pollutants in ground water downwind of St. Louis exhibit some relationship to the urban-produced rain increases. Measurable and economically significant increases in corn yields (1-8 bu/acre) have also been found downwind of St. Louis and Chicago. Obviously, the inadvertent urban-related changes in precipitation have relevance to the hydrology of the rather localized areas of their occurrence. (Author conclusions)

39658 **APTIC NO. 62070**

Fischer, William H.

DISTURBANCE PRODUCED BY GLOBAL POLLUTION IN ANTARCTIC AIR DOCUMENTED BY SOLAR RADIATION DEPLETION. *Antarctic J. U. S., p. 185-186, July-Aug. 1973. 6 refs.*

The very high value of the Angstrom turbidity coefficient beta of Michael Kuhn based on data taken at McMurdo Station in Nov. and Dec. 1966 is criticized. The McMurdo atmosphere seem to be affected by human activity to the extent that its higher than those determined at nearby locations that are free from human activity. The particulate in and around McMurdo in 1966 was only slightly contaminated with maritime aerosol as shown by the very few sodium chloride crystals found in microscopic examination of impactor samples. Therefore, McMurdo in 1966 would seem to represent an upper bound to antarctic coastal turbidity and the high beta value is inaccurate.

39659 **APTIC NO. 62066**

Frenzen, Paul

THE OBSERVED RELATION BETWEEN THE KOLMOGOROV AND VON KARMAN CONSTANTS IN THE SURFACE BOUNDARY LAYER. *Boundary-Layer Meteorol., vol. 3:348-358, 1973. 15 refs.*

In steady, neutrally-stratified flow over uniform terrain, the Kolmogorov constant for the one-dimensional spectrum in the inertial subrange and the von Karman constant of the logarithmic profile are related by an equation. The Kolmogorov constant times the logarithmic profile to the 4/3 power is approximately equal to 0.136, where the numerical value results from field measurements recorded in near-ideal conditions. This experimentally-observed Kolmogorov-von Karman K-von K product is close to the value designated by a one-dimensional equivalent of the theoretical relation previously given by Roth. Moreover, it is in remarkably close agreement with new values of both constants independently proposed in recent years. (Author abstract modified)

39660 **APTIC NO. 61664**

Gatz, Donald F.

SCAVENGING RATIO MEASUREMENTS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 133-144, 1973. 10 refs.*

Scavenging ratios for copper, lead, iron, magnesium, manganese, and zinc were measured during 1971 as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis. The observed values ranged from about 150 for Pb to 1280 for Mg. No significant upwind/downwind differences were observed for scavenging ratios, although concentrations in both precipitation and air showed variations ranging up to about 10-fold. The ratio for Pb was significantly smaller than that for each of the other elements. Additionally, plots relating scavenging ratio to literature values of mass median diameter for the various elements showed a continuous increase in scavenging ratio with particle size. Little or no relationship appeared between scavenging ratios and any of the several meteorological or particle parameters examined, including atmospheric stability, rainfall amount, synoptic rain type, and solubility of aerosol materials in the rain. (Author summary modified)

39661 **APTIC NO. 61640**

Gloria, H. R., J. N. Pitts, Jr., J. V. Behar, G. A. Bradburn, R. F. Reinisch, and L. Zafonte

AIRBORNE MEASUREMENTS OF AIR POLLUTION CHEMISTRY AND TRANSPORT. I: INITIAL SURVEY OF MAJOR AIR BASINS IN CALIFORNIA. *California Univ., Riverside, Calif., Statewide Air Pollution Research Center, SAPRAC Rept. 1, 39p., 1973 (?). 20 refs.*

Photochemical air pollution in California was investigated by an instrumented aircraft. Simultaneous measurements of the most important chemical constituents (ozone, total oxidants, hydrocarbons, and nitrogen oxides, as well as several meteorological variables) were made. State of the art measurement techniques and sampling procedures are discussed. Data from flights over the South Coast Air Basin, the San Francisco Bay Area, the San Joaquin Valley, the Santa Clara, and Salinas Valleys, and the Pacific Ocean with 200 miles of the California coast are presented. Pollutants were concentrated in distinct layers up to at least 18,000 ft. In many of these layers, the pollutant concentrations were much higher than at ground level. These findings bring into serious question the validity of the present practice of depending solely on the data from ground based monitoring stations for predictive models. (Author abstract)

39662 **APTIC NO. 62672**

Grosh, Ronald C. and Richard G. Semonin

MOISTURE BUDGETS AND WIND FIELDS OF THUNDERSTORMS PASSING OVER AN URBAN AREA IN THE MIDWEST. *Preprint, American Meteorological Society, 8p., 1973. 5 refs. (Presented at the American Meteorological Society, Conference on Severe Local Storms, 8th, Boston, Mass., Oct. 15-17, 1973.)*

Two storms which passed over the St. Louis urban area and which produced heavy rainfall downwind of the city were studied at selected time intervals. The storms occurred during different synoptic conditions and had markedly different air flow structures. However, both storms seemed to derive most of their inflow from low levels. In both cases the air which entered the storm was rather dry with tracjectories over the city. This dry air inflow may have weakened the updrafts of the two storms and led to increased precipitation activity. (Author summary)

39663 **APTIC NO. 62624**

Hesstvedt, Eigil

EFFECT OF SUPERSONIC TRANSPORT UPON THE OZONE LAYER, STUDIED IN A TWO-DIMENSIONAL PHOTOCHEMICAL MODEL WITH TRANSPORT. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meeting., London, England, 1973, AGARD-CP-125, p. 6-1-6-8. 9 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A steady state two-dimensional model of the stratospheric ozone layer is presented. Photochemical reactions involving oxygen, hydrogen, and nitrogen are considered along with the effect of a parameterized, two-dimensional transport and by mean motion and eddies. A parameterized meridional distribution of nitrogen oxides is applied which is computed from reduction of O3 in the NOx emissions from supersonic aircraft is studied. A fleet of 200 aircraft, flying at given altitudes and uniformly distributed over the globe, is assumed. The effect depends critically upon the flight level. For mid-latitude, summer, the O3 column density is reduced by 0.4% for a flight level of 18 km. For flight levels 23 km and 28 km the reduction is 1.6% and 2.3%, respectively. Accordingly, the increase in ultraviolet radiation amounts to approximately 0.8%, 3.2%, and 4.6% for the same flight levels. (Author summary modified)

39664 **APTIC NO. 59634**

Hogstrom, U.

DISPERSION AROUND A SINGLE POINT SOURCE. *VDI (Ver. Deut. Ingr.) Ber., no. 200:53-57, 83-95, 1973. 13 refs.*

A state-of-the-art report is given on dispersion from a point source. First the ideal case is discussed, then the different complications that arise in practice are discussed. Finally, the most important approaches to solve the problem of determining the dispersion from an actual chimney, existing or conceived, are discussed. (Author introduction modified)

39665 **APTIC NO. 62099**

Holdeman, James D.

DISPERSION OF TURBOJET ENGINE EXHAUST IN FLIGHT. TECHNICAL NOTE. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-24, Rept. NASA TN D-7382, E-7479, 22p., Aug. 1973. 12 refs.*

NTIS: N-73-28174

The dispersion of the exhaust of turbojet engines into the atmospheres was estimated by using a model developed for the mixing of a round jet with a parallel flow. The analysis is appropriate for determining the spread and dilution of the engine exhaust from the engine exit until it is completely entrained in the aircraft trailing vortex pair. In this region, chemical reactions are not expected to be important and were not considered in the flow model. The analysis is an integral momentum method for which the dimensionless local velocity difference profile shapes and the shear stress relation must be specified. The eddy viscosity model used in the shear stress relation was formulated by assuming that the eddy viscosity is directly proportional to the jet mass flow rate plus the absolute value of the entrainment mass flow rate and inversely proportional to the jet width. Calculations of the dilution of the exhaust for large and small aircraft turbojet engines with and without afterburning at typical flight conditions are presented. A 1000:1 average dilution may be expected in less than 15 sec after aircraft passage. This dilution corresponds to distances from 0.5 to 7 km downstream of the engine exhaust for the engines and conditions examined. The large range depends on both engine size and power level. Measurements of carbon monoxide, nitrogen oxides, and ozone made in the wake of an F-104 aircraft flying at Mach 0.8 at an altitude of 11 km at distances from 2-10 km behind the F-104 are presented. Calculated concentrations for the J79 turbojet engine plume at conditions of the flight experiment are in good agreement with the measured pollutant levels. (Author summary)

39666 **APTIC NO. 62618**

Hoot, T. G., R. N. Meroney, and J. A. Peterka

WIND TUNNEL TESTS OF NEGATIVELY BOUYANT PLUMES. *Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Environmental Protection Agency Grant AP-01186, Program Element 1AA009, Rept. EPA-650/3-74-003, 104p., Oct. 1973. 35 refs.*

Wind tunnel test results are reported for negatively bouyant plume emissions into a quiescent medium, laminar crosswind and turbulent boundary layer. Topics covered include: plume rise equations; concentration determinations; experimental measurements of plume rise and concentration; instrumentation for velocity and temperature measurements, gas mixing and smoke visualization, and concentration measurements, as well as wind tunnels and vortex generators; and experimental results for plume rise and concentration. An expression is given for ground concentration when plumes of relatively high density are exhausted into light winds such that the density difference and resulting vertical motion dominates diffusion. The rise height of a negatively buoyant plume is shown to be increased by increasing the discharge velocity, and the effect of negative buoyancy on the behavior of ground sources is primarily multiplicative as the decay relationship is not changed in form.

39667 **APTIC NO. 62289**

Horowitz, Alan, William S. Meisel, and David C. Collins

THE APPLICATION OF REPRO-MODELING TO THE ANALYSIS OF A PHOTOCHEMICAL AIR POLLUTION MODEL. (FINAL REPORT). *Technology Service Corp., Santa Monica, Calif., Environmental Protection Agency Contract 68-02-1207, Program Element 1A1009, EPA-650/4-74- 001, 109p., Dec. 1973. 9 refs.*

NTIS: PB-231667/AS

Several physical models which simulate the impact of emissions and meteorology on the creation and dispersion of photochemical smog have been developed. Characteristic of most of these models is that they are highly computational and require a great deal of input data. It is generally difficult to systematically explore the implication of the models or to use them in a planning context where many model runs are required. Repro-modeling, the analysis and replication of the input/output characteristics of the model, is explored as a means of meeting these objectives. A study of the application of repro-modeling in the SAI model developed for the Los Angeles Basin is described. The major objectives are a feasibility test of the repro-modeling approach; a limited interpretation of the implications of the model; and an efficient repro-model program which duplicates input-output relationships of the original model. The repro-model developed is analyzed in a particular application context (transportation emission control policy evaluation) and its general implications are discussed. Examples of use of the repro-model, which requires orders of magnitude less computer time than the original model, are provided. (Author abstract modified)

39668 **APTIC NO. 61648**

Huff, Floyd A.

SUMMARY REPORT OF METROMEX STUDIES, 1971-1972. INTRODUCTION. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 1-4, 1973. 2 refs.*

The purpose and scope of a report on Metromex, a large-scale investigation of inadvertent weather modification in the urban St. Louis area, are outlined along with the program's background and operational facilities. General program goals are: to study the effects of urban environments upon the frequency, amount, intensity, and duration of precipitation and related severe weather; to identify the physical processes of the atmosphere which are responsible for producing the observed urban weather effects; to isolate the urban factors which cause the observed effects; and to assess the impact of urban-induced inadvertent weather changes upon the wider issues of society. The purpose of the report is to summarize findings to date from analyses of data collected in the 1971-1972 field operations. Diagrams are provided for equipment and facility sites and summer rainfall patterns.

39669 **APTIC NO. 61649**

Huff, F. A. and E. E. Schlessman, Jr.

STUDIES OF MONTHLY, SEASONAL, AND STORM RAINFALL 1971-1972. *In: Summary Report of Metromex Studies, 1971-1972, Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 5-27, 1973. 3 refs.*

Results are presented from surface studies of monthly, seasonal, and storm rainfall conducted during 1971-1972 as part of Metromex, a large-scale investigation of inadvertent weather modification in the St. Louis Area. Topics covered include: monthly and seasonal rainfall distributions, rainfall variability in 1971-1972 on the Metromex network, frequency of measurable rainfall, distribution of heavy rainstorms, weekday-weekend occurrences of rainfall, rank score tests, rainfall on potential- effect and no-effect days, the relation between wind direction and seasonal rainfall, wind-rainfall relations on potential effect and no-effect days, stratification of seasonal rainfall by synoptic storm types, and diurnal distribution of summer rainfall. A study of the distribution of heavy rainstorms indicates that an urban-intensification mechanism applied to naturally occurring storms is instrumental in producing urban-related increases in summer rainfall, provided that a primary high found in the Edwardsville-Collinsville region is wholly or partially related to urban effects.

39670 **APTIC NO. 61658**

Huff, F. A.

RELATED STUDY OF URBAN EFFECTS ON SURFACE AND GROUNDWATER QUALITY. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 98-102, 1973. 1 ref.*

Results are presented from well water analyses and stream water analyses for a watershed of 22 sq mi located in the region of maximum urban effect on precipitation in the St. Louis area as part of the Metromex field program, a large-scale investigation of inadvertent weather modification in the St. Louis area. The well water analyses indicated a possible external source of lithium from industrial activities in the St. Louis region. Natural lithium concentration in the stream water analyzed changed significantly following heavy rainfalls because of the dilution effect, and the detection of small amounts of rainwater tracer reaching the stream was concluded as impossible due to the dilution effect from rainfall of moderate to heavy intensity. The median summer concentration of atmospheric tracer lithium in the stream water was comparable to the concentrations in rural areas. Time distributions of lithium and sodium showed similar patterns, increasing in concentration from late June until late July during a period of relatively light rainfall. Increases generally occurred during periods of light rainfall and runoff, while reversals occurred when heavy rainfall was followed by above-normal runoff which resulted in greater dilution of atmospheric and surface contaminants reaching the stream. The pH curve was relatively flat and did not show a strong relationship with rainfall. No distinct trend was noted for variance of zinc concentration values between rural and highly industrialized areas.

39671 **APTIC NO. 61667**

Huff, F. A.

GENERAL SUMMARY AND CONCLUSIONS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 163-169, 1973.*

Elements of the Metromex program, a large scale investigation of inadvertent weather modification in the urban area of St. Louis (1971-1972), are summarized. Summary outlines and conclusions are given for: seasonal and storm rainfall studies; synoptic studies; thunderstorm and hail studies; surface raincell studies; surface condensation nuclei and raindrop measurements; surface wind, temperature, and humidity; urban effects on surface and groundwater quality; radar studies; the airflow program; chemical tracer studies; pH measurements in rainfall: scavenging ratio measurements; aircraft filter sampling and analysis; and aircraft measurements and observations of condensation nuclei, temperature, wet bulb depression, cloud bases, and updraft features.

39672 **APTIC NO. 61829**

Ishikawa, Seiji, Yasuhiro Morita, and Masahiro Kaneda

MEASUREMENT OF ION AEROSOLS OVER THE BONIN ISLANDS. *(Ogasawara Chichijima ni okeru ion erozoru no kansoku). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9: 42-45, Aug. 1973. 4 refs.*

Up to about 300 km from the main land of Japan, air pollutants diffuse into the Pacific atmosphere and the concentration decreases in proportion to the distance. At greater distances the concentration of micro particles stabilizes at the level of the background pollution level of the oceanic atmosphere. However, the fact that the electroconductivity of the air around the Marcus Islands is higher than that of the northern Pacific suggests that the concentration of microparticles over the ocean depends on the transporting air masses and the history of the transport. Ionic aerosols were observed on a 150 m high cliff of the main island of the Bonin Islands in March 1973. Electroconductivity histogram showed 2.1-2.2 times 10 to the minus 14th power and was close to that of the northern Pacific. Nucleus micron particles were also measured and no special correlation was found between them. The average ratio of large particles (0.15-5 microns) was 21/cc, compared to 1.1-7.2/cc (particle size 0.2-1 micron) observed in the Central Pacific in 1972. These figures suggest a difference in the behavioral patterns of particles larger and smaller than 0.1 micron.

39673 **APTIC NO. 62621**

Johnston, Harold S. and Gary Whitten

REACTION OF OZONE WITH NITROGEN OXIDES AT HIGH ALTITUDES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 2-1-2-13. 35 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The reaction of ozone with nitrogen oxides at high altitudes is described. Ozone is formed in the stratosphere by the dissociation of oxygen by ultraviolet radiation below 242 m. Ozone is removed from the stratosphere by the reaction of O2 atoms and O3; by transport to the troposphere; by catalytic reactions with free radicals based on water; and by catalytic reactions with the oxides of nitrogen. The most important factor in the natural removal of stratospheric O3 is the catalytic cycles based on the oxides of N2. The natural source of nitric oxide in the stratosphere has been tentatively identified, and the source strength has been calculated by three different investigators. There is about a factor of four uncertainty in the natural rate of injection of NO in the stratosphere. There is about a factor of four uncertainty in the calculated rate of introduction of NO in the stratosphere from full-scale operation of supersonic transports of current and past designs. Within these two ranges of uncertainty, 500 supersonic transports would introduce NO in the stratosphere at a rate comparable to the known natural sources. (Author abstract modified)

39674 **APTIC NO. 61656**

Jones, Douglas M. A.

METROMEX SURFACE WINDS. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 89-94, 1973.*

The surface network of wind-measuring equipment installed for Project Metromex, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis is described along with data collection techniques and analytical results. Diagrams are provided showing locations of wind stations and wind rose patterns for the months of June, July, and August of 1971 and 1972. The 2 years of wind direction data generally do not show a trend which would indicate that a particular site was biasing winds blowing over it, except for one case during August of 1971 and 1972 where a southeasterly wind was indicated contrary to southwesterly recordings from surrounding stations.

39675 **APTIC NO. 61657**

Jones, Douglas M. A.

NETWORK SURFACE TEMPERATURE AND HUMIDITY. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 95-97, 1973.*

The surface temperature and humidity measuring network associated with the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis, is described along with analytical findings. Hygrothermographs in standard Cotton Region shelters were used to measure and record surface temperature and humidity, and corrected data were punched into cards for machine calculation of the dew point temperature for each hour at each station. The greatest contrasts in temperatures between the urban complex and the surrounding rural areas occurred at dawn, with the measuring site at the Gateway Arch having the highest minimum temperature (72.2 F). The coldest temperature (61.6 F) was measured at two rural sites. The urban heat island was very much in evidence. Diagrams are provided showing recording locations and mean temperature fields.

39676 **APTIC NO. 61812**

Kasprzycki, A.

LOCAL STATISTICAL MODEL OF THE AIR POLLUTION FORECASTING. *Idojaras (Budapest), 77(5):296-303, 1973. 6 refs.*

A local statistical model for air pollution forecasting is described. The space time field of obtained air pollution data was divided into two parts in which one part was independent of time and the second independent of space. The model allows forecasting to be well determined in respect of the probabilistic logic. It is possible to obtain the statistical distribution function on the forecasted pollution concentration. The model is simple compared with the multiple source diffusion models. There are disadvantages to the model: about 1-2 yr of simultaneous meteorological and air pollution data are required; changes in the emission sources degrade the method; and the model cannot predict the effect of adding, removing, or modifying the important pollution sources. The main advantage of the proposed model due to the introduction of the probabilistic logic is in the quantitative forecasting of the weather and/or pollution. (Author conclusions modified)

39677 **APTIC NO. 62379**

Kikuchi, Hatsuhiro

HORIZONTAL DISTRIBUTION OF AIR POLLUTANTS IN SAPPORO JUDGED BY THE ELECTROCONDUCTIVITY AND PH MEASUREMENTS OF SNOW. *(Kosetsu no denki dendodo, pH sokutei kara mita Sapporo shinai no taiki osen no suihei bunpu). Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9:32-37, Aug. 1973.*

Based on the previous finding that the removal of pollutants in the air is three times greater by washout than rain, snow was sampled at 15 locations in Sapporo. Electroconductivity and hydrogen ion concentrations in melted snow were measured, and the average dispersion of pollutants was investigated. The samples were taken between Jan. and March 1973. To measure sulfur oxides and nitrogen oxides in the air, the correlation between SOx in the atmosphere at the time of snow and electroconductivity was measured. The SOx in the direction of wind can be generally conjectured by the electroconductivity of snow on the lee side. The precipitation quantity, electroconductivity, and pH horizontal distribution could be classified into several clear-cut types: the concentric type, the strong seasonal wind type, and the weak seasonal wind type. Both electronconductivity and pH decreased with the increase of precipitation, and with less than 5 mm/day, both were divided into two groups. One location close to the sea had an extremely high conductivity and very low pH. Generally, electroconductivity was within the range of 10-100 micron cm-1, and ph was within 4-7. Electroconductivity showed characteristic differences with seasonal winds and eastern wind.

39678 **APTIC NO. 62509**

Kikuchi, Katsuhiro and Tatsuo Endo

MEASUREMENT OF AEROSOL CONCENTRATION AND ELECTROCONDUCTIVITY OF RAIN AND SNOW IN SAPPORO. *(Sapporo ni okeru erozoru nodo to kosui no denki dendodo no sokutei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 8:89-92, Feb. 1973.*

Measurements of aerosol concentration and electroconductivity in Sapporo were taken between December 1971 and February 1972, and the amount of snow and washout by snow were measured. The aerosol concentration was measured by a photo-electric counter at 9 am, 3 and 8 pm daily and any other time when the weather was extraordinary. Electroconductivity of melted snow was measured at 9 am every morning. The aerosol concentration was high at 9 am and low at 8 pm. During precipitation, up to a 40% decrease was noted in aerosol concentration. Suspended particulates, sulfur dioxide, nitrogen dioxide, and nitric oxide were measured and compared with the amount of snow precipitation. In every case, the measurement decrease was noted in snow, but the decreases were especially notable for suspended particulates and NO. The ratio of washout of suspended particulates by rain and snow was 23:77. The average winter aerosol concentration in Sapporo was 7 to 8 times 1000/cu cm.

39679 **APTIC NO. 62074**

Leipper, Dale F.

SOME FEATURES OF THE CALIFORNIA COASTAL ATMOSPHERE. *Preprint, 10p., Nov. 1973. 3 refs.*

The formation of coastal fog and its relation to air pollution in California are discussed. The coastal air temperature structure may be considered as consisting of deviations from the common adiabatic lapse rates found over the open sea. The most important deviations are related to arrival of descending air from inland and to unusual cooling of the surface layers in fog. Air pollution along the California coast is controlled by the same atmospheric events as fog. The fog development sequence seems to take place frequently in winter. With the approach of summer, however, a fog situation may develop and move through various stages to a stage which may persist for several weeks or more at a time, giving the steady stratus overcast which is common along the west coast. (Author summary modified)

39680 **APTIC NO. 61831**

Magono, Osaharu and Sadako Kubota

STUDIES ON THE AIR PURIFICATION MECHANISM OF SNOW. *(Kosetsu ni yoru taiki seijo sayo no kenkyu (Report 2). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9: 38-41, Aug. 1973.*

The snow precipitation and aerosol concentration were continuously observed in early March 1972 on the campus of Hokkaido University. The investigation was conducted from midnight to early morning when there was no artificial disturbances and when the wind velocity was less than 1 m/sec. The results are presented in graphs. The periods of snow and amount, and the decrease in aerosol concentration always coincided. The amount of aerosol decrease was therefore regarded as the rate of arresting of aerosol by snow, and the arresting rate was formulated. The rate fluctuated with the intensity of snow, and this was as high as that for the rain drops arresting cloud particles. However, when the snow stopped, the ground concentration of aerosol recovered almost to the same level as before the snow, and aerosol emission from the ground surface was suspected. The arresting of aerosols by snow crystals seemed to depend much more on heat turbulence than on the principle of fluid dynamic collision. The rate of aersol concentration decrease by snow seemed to be about the same as decrease by natural dispersion.

39681 **APTIC NO. 61682**

Megaw, W. J.

THE BACKGROUND ATMOSPHERIC AEROSOLS. *Contemp. Phys., 14(6): 541-557, 1973. 12 refs.*

An attempt is made to define the background atmospheric aerosol and the reasons and methods for measuring it are discussed. Three current methods for monitoring the tropospheric aerosol level are described. It is suggested that the obvious method of establishing a large network of monitoring stations is not necessarily the best or most economical and that alternatively an area should be identified where the atmospheric aerosol is in some way typical of that in the atmosphere as a whole. Reasons are advanced which suggest that Greenland may well be such an area. The results of a 1971 preliminary expedition indicate that a satisfactory method of monitoring secular trends in the atmospheric aerosol of at least the Northern Hemisphere may be to mount a relatively inexpensive annual or biennial expedition to measure the summer tropospheric aerosol over Greenland. (Author summary modified)

39682 **APTIC NO. 61828**

Misaki, Masao, Miwako Ikegami, and Isuo Kanazawa

THE CHANGE OF LAND AEROSOLS PARTICLE SIZE DISTRIBUTION IN THE PROCESS OF DISPERSION OVER THE SEA. *(Rikuchi kigen erozoru no ryukei bunpu no kaijo kakusan katei ni okeru henshitsu). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9:50-53, Aug. 1973.*

The change of aeorsol distribution patterns according to particle size was studied by following diffusion of aerosol. The specific purpose was to see whether the gravity of distribution changes toward large particles or small particles as a result of dispersion. Observations were made by a ship between Tokyo Bay and the Bonin Islands tracing aerosols in the winter of 1972. The weather was observed for reference. The ion mobility spectrum between Tokyo and the Bonin Islands is presented. Small particles slowly decreased in number as the ship advanced, whereas large particles rapidly decreased in sampled air. For instance, particles of 2.5 micron began to decrease in Tokyo Bay. The decay constant for aerosols and the particle radius form a fairly clear straight line. The gravity of particle size distribution shifts from large particles to smaller as aerosols disperse away from the emission sources.

39683 **APTIC NO. 61650**

Morgan, G. M., Jr., R. C. Beebe, and D. A. Brunkow

APPLICATION OF FRONTAL CLIMATOLOGY BY DIGITAL TECHNIQUES TO PROJECT METROMEX. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 28-35, 1973.*

Average frequencies of stationary fronts for the summer months of June, July, and August are displayed on weather maps (60 by 60 grids, 180 by 180 grids, and 300 by 300 grids) for the continental United States in connection with the Metromex program, a large-scale investigation of inadvertent weather modification in the St. Louis area. A pronounced belt of maximum frequencies is observed through the middle of the continent, with nearly east-west orientation; and the region of this belt can be considered as one where southward surges of cold air tend to stall out. Cold air lies to the north of the belt, while warm air lies to the south. Observations at St. Louis during the 1971-1972 period are consistent with the exception that the greatest frequencies of convective rains and squall systems occur to the south of this band or, conversely, that convective rains are infrequent for some distance north of it. Stationary front distributions for each month show a high concentration band running through St. Louis or to the south of it in all months except June 1971 and August 1972. Frequencies in the maximum band are generally higher in the two downwind-effect months, indicating also greater sluggishness in the cold air penetrations.

39684 **APTIC NO. 61651**

Morgan, G. M., Jr. and R. C. Beebe

SYNOPTIC AND RELATED STUDIES. *In: Summary Report of Metromex Studies, 1971-1972, Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 36-39, 1973. 1 ref.*

Data are given for the results of two years of classification of rain events by synoptic type and event (urban effect versus no effect) as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the St. Louis area. Air mass storms are the most frequent occurrence on the network for the summers of 1971-1972, followed by squalls and cold fronts. Air mass storms are also the most frequent on urban effect days, followed by squalls; however, squalls dominate in those cases with relatively heavy maxima. The overall percent of rains classified as urban effect storms increases steadily as more intense rains are considered. The heavier rains in the St. Louis area during June, July, and August are produced mostly by squall systems for the 1971-1972 period. Mixing depth, a quantity found useful in air pollution forecasting, is related to the occurrence of urban effect rains at St. Louis based on analysis of the 1971-1972 data. Mixing depths greater than 1800 m seem to favor the downwind enhancement of precipitation. This and the relationship between effect rains and the more intense squall systems tend to relate the urban effect to cases with strong instability and free mixing from the lowest air layers to cloud base.

39685 **APTIC NO. 61832**

Morita, Yasuhiro, Seiji Ishikawa, and Masahiro Kaneda

AEROSOL MEASUREMENT BY AN AIRPLANE. *(Kokuki ni yoru erozoru no kansoku kekka). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 9:54-58, Aug. 1973.*

To investigate the dispersion of air pollutants along air currents and to trace the extent and the pattern of dispersion, air was sampled by an airplane. The measurements were taken at 1500 m from the ground above the Nagoya industrial area, along the shore of Atsumi Bay, over Atsumi and Chita peninsulas, and over the ocean off the coast of these peninsulas. Two flights were made in March 1973, and the first flight tested the air suction chamber, the flow rate, temperature, and the humidity in the chamber. The number of nucleic particles in the sampled air were measured by a coagulation nucleic particle counter. On the second flight, the distribution of aerosol particle sizes was checked with particles of more than 0.15 micron radius. The airplane's engine exhaust pipe was bent outside to avoid sampling any of the emission gas. Maps are presented showing particle distributions and air current movements. The aerosol material found in sampled air showed that the emission source was the industrial area on the ground and that the vertical mixture of air was even and complete at the height of 1500 m. The measurements of particle distribution, time change of particle distribution, and the time change of density of particles by radius sizes are presented in graphs.

39686 **APTIC NO. 61913**

Nakano, M., M. Mizutani, M. Sato, T. Nakano, and H. Kono

DATA ANALYSIS ON PHOTOCHEMICAL OXIDANTS IN OSAKA CITY. *(Osaka-shi ni okeru kokagaku taiki osen kaiseki (I)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):578, Oct. 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 301.)*

Data on pollutants and meteorological conditions obtained by 11 monitoring centers in May to October of 1972, were used to analyze the trend of photochemical reactions in Osaka city. When the average wind velocity was under 5 m/sec at noon, the oxidant concentration had a tendency to increase in the afternoon. Contrary to those of nitric oxide and nitrogen dioxide, the hydrocarbon concentration decreased only slightly at the time of high wind velocity. The oxidant concentration was high in July when wind direction was SW-WNW. However, the average concentration was higher during May to October when wind direction was NNE-SE. When temperature was below 22 C at noon, the oxidant concentration usually was lower in the afternoon. The average oxidant concentration was higher from 8 am to 6 pm, during which ultraviolet radiation is strong. However, the concentrations of primary pollutants tended to decrease during this period.

39687 **APTIC NO. 61681**

Norlund, Goran

A PARTICLE-IN-CELL METHOD FOR CALCULATING LONG RANGE TRANSPORT OF AIRBORNE POLLUTANTS. *Finnish Meteorological Institute, Helsinki, Finland, TR-7, 21p., 1973. 6 refs.*

A particle-in-cell method for the numerical calculation of airborne pollutant transport over long distances is presented. The difference scheme of Egan and Mahoney is used for computing the advective transport in order to eliminate pseudo-diffusion errors. Calculation of the spread of sulfur dioxide over north western Europe within 2 days is given as an example of the application of the method and the estimated concentrations over Finland are compared with actual observations. (Author abstract)

39688 **APTIC NO. 61654**

Schickedanz, Paul T.

USE OF SURFACE RAINCELLS IN EVALUATING INADVERTENT RAIN MODIFICATION. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Grants GA-28189X, GI-33371, GI-38371 and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 57-83, 1973. 13 refs.*

Analyses of 1971-1972 raincell data are presented as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis. Small isolated precipitation areas in the surface rainfall patterns, characterized by closed isohyets of high intensity gradients, are designated as surface raincells; and the underlying assumption of the raincell analyses is that changes which occur in the surface raincell parameters in the vicinity of urban-industrial sources are broadly indicative of induced changes in the cloud precipitation processes. The rainfall volume is observed to be 131% greater for cells occurring in the urban-industrial region of St. Louis-Belleville than for cells in a control sample, with increases in average rainfall, areal extent, and duration being 19, 90, and 24%, respectively. The most frequent initiation area is approximately 6 mi southeast of the largest industries in St. Louis and East St. Louis. Overall, there is very strong evidence that the cell parameters are altered by the urban- industrial environment.

39689 **APTIC NO. 61662**

Semonin, R. G.

METROMEX CHEMICAL TRACER STUDIES. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 125-129, 1973. 3 refs.*

Results of chemical tracer studies (aircraft and ground release) performed as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis are summarized from field experiments designed to examine the scavenging of sub-micron particles by precipitation and convective cloud processes. The most important results are as follows: the almost total absence of lithium in non-tracer rainfall indicates its suitability as a tracer chemical; the low-level releases of tracer lithium indicate than an urban- industrial aerosol of the proper physico-chemical properties can be processed by precipitating convective storms and deposited in the region of the observed climatic rainfall maximum in Illinois; and a target-control design for advertent weather modification of multicellular convective systems is not a sound approach unless the target and control are separated by at least 20 miles. (Author summary modified)

39690 **APTIC NO. 61663**

Semonin, R. G.

PH MEASUREMENTS IN RAINFALL. *In: Summary Report of Metromex Studies, 1971-1972. Illinois State Water Survey, Urbana, National Science Foundation Research Grants GA-28189X, GI-33371, GI-38371, and Atomic Energy Commission AEC-1199, Rept. of Investigation 74, p. 130-132, 1973.*

Data are reported for rainfall pH measurements taken as part of the Metromex program, a large-scale investigation of inadvertent weather modification in the urban area of St. Louis. The pH was measured in several storms during 1972; and average values of pH, precipitation, and hydrogen ion deposition were determined. The initial data indicate that the mean pH over an area of 750 square mi is 4.94 and varies from 4.26-6.82. The values are not adjusted for the carbon dioxide saturation which would acidify rainwater to a pH of 5.7. No distinct correlation appears between the precipitation and the pH. Likewise, no relationship appears between the areal pH pattern and the industrial areas of the St. Louis region.

39691 **APTIC NO. 62339**

SethuRaman, S. and J. E. Cermak

STRATIFIED SHEAR FLOWS OVER A SIMULATED THREE-DIMENSIONAL URBAN HEAT ISLAND (TECHNICAL REPORT). *Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Office of Naval Research Contract N00014-68-A-0493-001, Proj. NR 062-414/6-6-68 (Code 438), Rept. CER73-74SS-JEC4, THEMIS Tech. Rept. 23, 219p., Aug. 1973. 53 refs.*

NTIS, DDC: AD767 063

Three dimensional airflow over a rectangular heat island was studied for various conditions of approach flow in a wind tunnel. Three different thermal stratifications of the approach flow were selected for the study: neutral, ground based, and elevated inversions. For each of these, flow studies were conducted with and without roughness over the heat island and for the conditions with and without heating. Approach flow temperature profiles were modeled according to atmospheric data available in the literature. For each of the 12 cases mentioned above, measurements of mean wind velocity, longitudinal velocity fluctuations, mean temperature and temperature fluctuation were made. In addition, mean concentration measurements of a radioactive gas released from a two dimensional, ground level line source upwind of the heat island were made. Flow patterns were visualized for different cases with the help of a passive smoke source. Comparisons of data from the wind tunnel measurements were made with the field data. The mechanisms of the heat island observed in the wind tunnel for different stratified flows were very similar to those observed in the field. The urban heat island plume that passes aloft downwind causes an appreciable reverse flow onto the heat island. The helical vortices at the edge of the heat island cause a reduction in the turbulence level resulting in high concentrations of the mass released from a continuous line source upwind of the heat island. A theoretical model was developed to predict the urban excess temperatures and velocities. (Author abstract modified)

39692 **APTIC NO. 62261**

Toropova, T. P.

SOME PROPERTIES OF THE ATMOSPHERIC AEROSOL. *Translated from Russian, ACSI, Dept. of the Army, Charlottesville, Va., Foreign Science and Technology Center, DIA Task T70-23-01, Rept. FSTC-HT- 23-408-72, SL-72-52-466, 11p., Aug. 29, 1973. 29 refs.*

NTIS, DDC: AD-771082

Properties of the atmospheric aerosol are explained based on measurements of sky brightness and atmospheric transparency. Characteristics which convey the most information on properties and size distribution of atmospheric aerosols include spectral transparency and spectral and angular pattern of the perisolar aureole. Available data was investigated and theoretical calculations were made. (Author abstract modified)

39693 **APTIC NO. 59955**

Verschueren, K.

CONTROL AND PREDICTION OF SULFUR DIOXIDE EMISSION AND CONCENTRATIONS AROUND A PETROLEUM REFINERY. *(Controle et prevision des emissions et immissions de SO2 autour d une raffinerie de petrole). Text in French. Tribune CEBEDEAU (Centre Belge Etude Soc. Eaux), 26(361):475-484, Dec. 1973.*

Sulfur dioxide concentration measurements around a petroleum refinery near Antwerpen, and computer programs for the calculation of ground level SO2 concentrations around industrial sources are presented. The SO2 concentrations measured at distances of 250 to 800 m around the petroleum refinery were lower than 308-425 micrograms/cu m in 95% of the entire measurement period. The contribution by the petroleum refinery to the SO2 concentrations was calculated by comparison of the SO2 concentrations measured on the windward side with those measured on the lee side. An Esso Research and Engineering computer program, developed for the calculation of the ground-level SO2 concentrations and of the stack heights by means of the Bosanquet-Carey-Halton formula of the plume rise, and of the Bosanquet-Pearson dispersion formula, requires such input data as the coordinates and the height of the stack, the wind speeds and wind directions, the gas flow rate at the stack outlet, the SO2 emission, the gas volume, and the temperatures of the flue gas and of the ambient air. The computer program permitted the calculation of the maximum ground-level SO2 concentration for a critical wind speed, a certain temperature gradient, a certain wind direction, and a given maximum SO2 emission.

39694 **APTIC NO. 62650**

Walton, John J.

DISPERSION OF EXHAUST PLUMES IN THE STRATOSPHERE. *Preprint, 4p., 1973. 6 refs. (Presented at the Conference on Environmental Impact of Aerospace Operations in the High Atmosphere, Proc., April 2, 1973, Conf-730614--3.)*

NTIS: UCRL-74679

The superposition of nonreactive plumes being dispersed by scale dependent diffusions were investigated to determine the characteristic concentration growth curves and profiles of such a flight corridor. A linear relation was found between maximum concentration and flight frequency while only a week dependence on corridor dimension was observed. As a specific example, a flight corridor 400 km in the horizontal by 3 km in the vertical with a flight frequency of 180 round trips per day was considered. Maximum corridor concentration rose to approximately 10% of that of a single plume at the end of the wake dispersion regime with concentrations dropping to 1/e of this maximum in 1800 km and 2.8 km in the horizontal and vertical respectively. (Author abstract modified)

39695 **APTIC NO. 61746**

Yokoi, Takehisa

THE OBSERVATION OF NONHYGROSCOPIC PARTICLES SUSPENDING IN THE ATMOSPHERE. *(Taikichu ni fuyu suru hikyushitsusei ryushi no kansoku). Text in Japanese. Yonago Kogyo Koto Senmon Gakko Kenkyu Hokoku (Rep. Yonago Tech. Coll.), no. 9:93-103, Dec. 1973.*

A collection of nonhygroscopic particles at the sea shores of two cities on the opposite sides of Nakaumi sea was conducted from March to August of 1970, using an impactor designed for sampling salt particles at sea. The particles were analyzed by microscope and by a light decrement method. Most of the particles collected were sand particles and the distribution could be approximated with the Junge distribution with an average beta of 1.5. Calculation showed that when the Junge distribution was applied there was no effect of the minimum particle size on the light decrement. No apparent relationship was found between the observed light transmitting and the calculated light decrement. The numbers of the particles collected at the two locations were found independent of the wind direction and wind velocity.

1972

39696 **APTIC NO. 62704**

Barnes, R. S. and W. F. Schell

PHYSICAL TRANSPORT OF TRACE METALS IN THE LAKE WASHINGTON WATERSHED. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 45-53. 28 refs. (Oct. 31-Nov. 2.)*

The geochemical cycle consists of source, transport, and sink. The natural source of trace metals is the lithosphere; transport occurs by wind, water, and ice; and the sinks are fresh water lakes, rivers, or oceans. The major modes of physical transport are advection and diffusion. The advective processes are by far the most important in the transport of most trace metals in the atmosphere or hydrosphere on a global scale. For certain volatile trace elements such as mercury, the diffusion process from the lithosphere is dominant. Contemporary transport and distribution of trace metals in a given region can be evaluated by the collection and analysis of air and water samples, dry fallout, precipitation, soils, and sediments. Sediment cores were measured in the Lake Washington area near Seattle, Washington. Results of these measurements for mercury, lead, zinc, copper, arsenic, antimony, iron, and sodium are given. The annual depositions in sediments for Lake Washington were 4700 tons Fe, 160 tons Na, 30 tons Pb, 22 tons Zn, 5 tons Cu, and 60 kg Hg. Trace metal enrichment of the sediments since 1916 was correlated with the urban development of the region. Trace metals were brought into the local hydrosphere principally by advective atmospheric transport. Fluvial processes were of considerable significance, but were reflected in the sediments primarily on the basis of the suspended load. Trace metal analysis of recent lake sediments can provide meaningful data concerning the impact of man on his environment, and offers an unique opportunity for evaluating past environmental conditions.

39697 **APTIC NO. 62220**

Barr, B. G., J. R. Eagleman, R. J. Eastmond, and S. A. Moran

ATMOSPHERIC POLLUTION AND ITS EFFECTS IN THE KANSAS CITY-TOPEKA CORRIDOR. PROGRESS REPORT. *Kansas Univ., Lawrence, Center for Research, Inc. National Science Foundation Grant GI-29760, NSF/RA/E-72-117, Rept. 1, 369p., June 1972. 98 refs.*

NTIS: PB 222804

The effects of air pollution in the Kansas City-Topeka air corridor on weather and climate and on natural and cultural vegetation were studied. Air pollution was measured by direct and remote sensing. Pollution sources, land use policies, growth trends, and other urbanization data in the area were studied. Sulfation rates, vertical distribution of pollutants, aerial photographic measurement of vegetation damage, sulfur dioxide effects on wheat, distribution of precipitation in the corridor (monthly, seasonal, and daily precipitation), plume dispersion, diurnal variation of pollutants, meteorological-pollution interactions with vegetation, and measurement methods are discussed. No consistent variations in the amount of rainfall between urban and rural locations were found; but urban areas had more rainy days. Comparisons for heat island intensity, relative humidity reduction, atmospheric pollution distributions, and evapotranspiration were made from data on condensation nuclei, radiation, sulfur dioxide, temperature, and humidity. Some injury to plant life did occur in the Corridor region. Some species were tested in laboratory studies for information on toxic tolerances and for possible use as indicator plants. Remote correlation spectrometry was used to measure sulfur dioxide and nitrogen dioxide in a vertical path. Aerial photography instrumentation was used to measure airborne particulates. The use of remote sensing for the monitoring of air pollution and related vegetation tests was successful.

39698 **APTIC NO. 62052**

Castleman, A. W., Jr.

AEROSOL CHEMISTRY. *Orleans Univ., (France), Summer Advanced Study Inst., Phys. Chem. Upper Atmos., Proc. Symp., Orleans, France, 1972, p. 143-157. 51 refs. (July 31-Aug. 11.)*

A review of the chemistry of aerosols is presented including the sources of aerosols in the upper atmosphere. There are three main sources: tropospheric, extraterrestrial, and those originating from in situ formation processes. In populated areas, aerosols are composed of as much as 40-60% sulfates, ammonium sulfate presumably being the most abundant single sulfur compound. Other major inorganic components are silicates, oxides of aluminum, iron, manganese, and magnesium, calcium carbonate, and components of sea salt including potassium, sodium, their chlorides, and to a less extent carbonates, and bromides. Organic compounds comprised of the photochemical reaction products of alpha and beta terpenes, which emanate from large forest areas, are other constituents. Aerosols resulting from extraterrestrial sources include cosmic dusts and meteorites, meteoritic ablation and fragmentation products, zodiacal cloud dust, and possible particles of solar origin. Depending on the type of meteor, it may contain varying amounts of Fe, Al, and nickel compounds as well as silicates. Aerosols are also produced via in situ chemical reactions. There are five broad classes of reaction which lead to particle formation. Those of potential importance in the atmosphere above the tropopause include: reactions leading to products which undergo homogeneous nucleation; chemical reaction followed by heteromolecular nucleation; and nucleation about ions.

39699 **APTIC NO. 62321**

Corrin, M. L.

ATMOSPHERIC CHEMISTRY AND PHYSICS OF AUTOMOTIVE LEAD. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 70-81, 1972.*

NTIS: PB 223623

Research dealing with the atmospheric chemistry and physics of automotive lead is discussed in terms of service functions, chemical transformations of atmospheric lead compounds, particle size determination, and washout efficiencies in automotive exhaust. The chemical transformations are being studied in a flow system with lead bromochloride; changes of the solid will be examined by means of X-ray diffraction of the gas by gas chromatographic techniques. Particle size determinations utilize the Andersen impactor with Teflon collector plates; this method is suitable for sampling times as low as 30 min. Preliminary results on the washout efficiency study indicate efficiencies on the order of .0001. With such efficiencies, the washout process leads to an almost negligible lead removal process from the atmosphere and cannot account for the lead concentrations measured in rainfall. The rainout process must enter strongly in the removal mechanisms. The research methodology and apparatuses are described.

39700 **APTIC NO. 62300**

Dabberdt, Walter F., F. L. Ludwig, and Warren B. Johnson

URBAN DIFFUSION OF CARBON MONOXIDE. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 62-72. 9 refs.*

A diffusion model was developed and tested. It is based on existing experimental data and previous research results, is a receptor-oriented Gaussian diffusion model, and is designed to calculate carbon monoxide concentrations from routinely available traffic and meteorological data. Model predictions were compared with measured data from Continuous Air Monitoring Program stations; calculated and observed values often differed significantly in magnitude, although they showed similar trends. An extensive field program showed that these differences are primarily the result of local effects in the street canyons and around buildings. A new submodel was designed to consider the urban mesoscale and the street microscale instead of only the urban mesoscale. The submodel is described and evaluated with data collected in downtown San Jose. A further evaluation of the model made with a field test in St. Louis, Mo. is also discussed.

39701 **APTIC NO. 62318**

Edwards, H. W.

SUMMARY. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 1-8, 1972. 2 refs.*

NTIS: PB 223623

Research progress on a study of the nature, extent, and effects of environmental pollution by automotive lead and of a model case study of an environmental pollution problem with a significant atmospheric component is reviewed. Instruments for studying atmospheric lead transport were designed and used to study automotive lead dispersion from several highway sources under a variety of meteorological conditions with a modified Gaussian dispersion model. Chemical and physical properties of lead were studied. Experiments were also conducted to determine the efficiency of washout as a mechanism for removing automotive lead from the atmosphere. Rainout is a stronger mechanism than washout, and washout can be neglected as a removal mechanism. The adsorption of n-hexane vapor on lead bromochloride was measured as a function of pressure and temperature. Lead was measured in soil near a highway and in plants exposed to lead nitrate solutions. Analytical methods were developed for measuring lead in air, soil, water, plants, and animals and for measuring traces of lead in blood, soil, and leaves. Laboratory tests of inadvertent weather modification determined the effect of lead and other automobile exhaust constituents on nucleation. A model was developed to correlate atmospheric lead dispersion with soil accumulation patterns. The amounts of lead in the tissues of mice living near a highway and in bacteria grown in lead-contaminated water were studied. Also, estimates were made of the economic effects of removing lead from gasoline. Research results were made available to various research groups, industrial scientists, and state and federal regulatory agencies.

39702 **APTIC NO. 62689**

Granat, Lennart

DEPOSITION OF SULFATE AND ACID WITH PRECIPITATION OVER NORTHERN EUROPE. *Stockholm Univ. (Sweden), Inst. of Meteorology, Rept. AC-20, 50p., Aug. 1972. 9 refs.*

Sampling networks in Northern Europe and the deposition of sulfate and acid with precipitation are discussed. The time and areal distribution of excess sulfur and net acid deposition are summarized. Excess S deposition is decreasing both to the north and to the south from a maximum over Holland and Belgium. The fluctuations in the yearly deposition of excess S are often large but several stations in adjacent areas show similar fluctuations. The areal distribution of excess acid is more complex than that of excess S. There is again a maximum over Holland and Belgium while Denmark, southern Norway and the west coast of Sweden receive substantial amounts of acid. The east coast of Sweden is less exposed. For large areas the increase of net acid deposition is approximately equivalent to the increase in excess S deposition. (Author abstract modified)

39703 **APTIC NO. 62325**

Grant, Lewis O.

INADVERTENT WEATHER MODIFICATION. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 148-165, 1972. 10 refs.*

NTIS: PB 223623

The effects of automobile exhaust on ice nucleation and thus on weather were studied in laboratory cloud chambers and field sampling. Temperature activation characteristics of ice nuclei in fresh exhaust and of ice nuclei in fresh exhaust exposed to iodine, of specific lead compounds actually present in automobile exhaust, and of other constituents in exhaust were studied. The significance of the laboratory findings over specific polluted sources and of the ice nucleating characteristics of atmospheric pollutants on clouds and precipitation were also studied. Neither raw exhaust nor any individual constituents were effective ice nuclei at temperatures warmer than -18 C. Exhaust became a progressively better nucleant at colder temperatures. Ice activation characteristics were enhanced by the addition of iodine vapor, but this was not due to the formation of lead iodide. Lead bromochloride is the primary lead compound in automobile exhaust, and I2 doesn t displace the ClBr to form PbI2. The PbClBr is not a good ice nucleant, and it is not a lead reaction with I2 in auto exhaust that produces the large numbers of ice nuclei when the exhaust is exposed to I2. Ice nucleants do not form from an I2 reaction with isooctane either. Therefore, reactions with other gasoline additives are being considered and tested. Future studies will involve reactions in a large storage chamber to establish nucleation changes with time and will involve field samplings. (Author abstract modified)

39704 **APTIC NO. 62282**

Mahlman, J. D. and S. Manabe

NUMERICAL SIMULATION OF THE STRATOSPHERE: IMPLICATIONS FOR RELATED CLIMATE CHANGE PROBLEMS. *Proc. Surv. Conf. Clim. Impact Assess. Program, 1972, p. 186-193. 16 refs. (Feb. 15-16.) Dept. of Transportation DOT-TSC-OST-72-13.*

The application of an atmospheric simulation model which extends to a height of about 30 km is described. The model is global and contains 11 vertical levels with a horizontal resolution of about 265 km. Realistic topography, an annual march of radiation, sea surface temperature, and water vapor effects are included. Zonal mean cross sections of temperature and zonal wind are shown and compared with reality. There is close agreement with observations except for a few important exceptions, e.g., the simulated stratospheric polar night votex is about a factor of two stronger than the observed. Snyoptic charts for the 38 millibar pressure level are shown for different seasons of the year. These reveal a satisfactory simulation of the stratospheric winter Aleutian anticyclone and polar vortex, as well as the summertime easterlies. Special attention is directed toward the problems of using atmospheric simulation models to study mechanisms acting to redistribute trace substances. Numerical and physical problems of modeling tracer advection, sub-grid scale transfer, sources, and sinks are discussed in relation to the climate change problem. On the basis of current experience, some speculations are offered on efforts toward solving problems in which the distribution of tracers affects, and is affected by, the dynamics of the stratosphere. (Author abstract)

39705 **APTIC NO. 62455**

Morita, Yasuhiro, Jiro Nagasaka, Seijo Ishikawa, and Masahiro Kanda

SUB-MICRON AEROSOL PROJECTIONS ABOVE THE OCEAN OF SOUTH KANTO. *(Kanto nanpo kaiiki ni okeru sabumikuron erozoru no haridashi). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 7:23-27, Aug. 1972.*

The electroconductivity of aerosol and nucleus concentrations was observed in the sea south of the Kanto area between October and Dec. 1971. The measurements were taken entirely within 300 km from the land where the effects of land pollution were directly felt. Electroconductivity increased drastically immediately after the ship left Tokyo Bay, and on the return voyage, conductivity decreased as the ship approached the land. When there was a sea breeze, electroconductivity suddenly increased and nucleus concentration suddenly decreased. The nucleus concentration dependend on the transport of pollutants from the land, and the level was determined by the time change after the air mass left the land area. The distribution of nucleus concentration fluctuates greatly in the land area, but it averages out by the passage of time, and for an aged air mass more than 60 hours old, both nucleus concentration and conductivity approach the level of background pollution.

39706 **APTIC NO. 62095**

Nisbet, I. C. T. and A. F. Sarofim

TRANSPORT AND TRANSFORMATION IN THD ENVIRONMENT. *Environ. Res., 5(3):273-287, Sept. 1972.*

The PCBs (polychlorinated biphenyls) released into the North American environment in the past are concentrated in landfill dumps (roughly 300,000 tons, without allowing for degradation), attached to sediments in rivers and the Great Lakes (roughly 20,000 tons), and attached to sediments on the continental shelf (roughly 10,000 tons). Another 20,000 tons has been widely distributed over the land and sea by aerial fallout and by disposal from ships. Transfer of PCBs within the environment takes place by volatilization, aerial transport on particulates, fallout, leaching from dumps, sediment transport in rivers and in the shallow sea, and sedimentation in the ocean. Uptake and transport by the biota is probably a quantitatively unimportant route of transfer of PCBs, but is of major biological significance. Virtually no evidence is available on the rate of transport by any of these routes, but it is expected that they are all very slow. In particular, PCBs in sediments in rivers and lakes are likely to move downstream and augment those in the shallow sea for a long period in the future. As a result of Monsanto s restrictions on distribution, several inputs into the environment are likely to have been sharply reduced. As existing products containing PCBs are scrapped, the remaining inputs into North America are expected to decline gradually over the next ten years. It is expected that this general picture will be applicable to other industrialized regions of the world, with the important exception that Monsanto s restrictions on distribution have not been followed by other manufacturers and that few countries (except Sweden) have imposed restrictions on uses or disposal. Except in North America, Great Britain, and Sweden, therefore, discharges of PCBs into the environment are likely to be increasing. (Author summary modified)

39707 **APTIC NO. 62059**

Ostrowski, A. C.

EFFECTS OF CHANGING EMITTER LOADS ON THE DISTRIBUTION OF ATMOSPHERIC POLLUTION CONCENTRATIONS. *(Wplyw zmiennego obciazenia emitora na rozklad stezen zanieczyszczen atmosfery). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):15-23, 1972. 11 refs.*

Formulas are given for determining concentrations of atmospheric air pollution from gases emitted from chimneys. An equation is also given for determining effective chimney height from the variables of wind velocity, velocity of the discharged gas, the stack diameter, and the heat emission from the stack. An example is given of a method for analyzing the influence of changing loads on the distribution of contaminants (sulfur dioxide in the example). Under settled meteorological conditions, SO2 concentrations are primarily affected by the gas discharge velocity to the stack diameter square ratio. To gain similar SO2 concentrations over periods of particular loads characterized by similar meteorological parameters, it is necessary to alter periodically the discharge area, thus adjusting the discharge velocity of gases.

39708 **APTIC NO. 61727**

Pack, Donald H. and Robert J. List

REGIONAL AIR POLLUTION. *In: Modifications of the Atmospheric Environment: Meteorology as Related to Human Environment. p. 35-42, 1972 (?) 16 refs.*

Reasons for considering air pollution on a regional basis and solving the pollution problems through modeling are discussed. Regional pollution categories have evolved because the information network, essential for pollution control, must be of a manageable size. Measurements of emissions, air quality, communications, and decision making bodies of reasonable dimensions are needed. Regional pollution sources include: natural sources, agricultural sources, and technical sources. The effects of air pollution can be summarized into five classes: damage to materials, damage to vegetation, effect on man and animals, pyschological, and environmental alteration. Regional problems can be appraised through a model of the air pollution region which relates the many sources of emissions to the relatively few measurements of air pollution concentration, and which can predict the consequences of added pollutants and the effect of various air pollution control actions on the subsequent concentrations. The ultimate model will consist of many sub-models: sub-models for the emissions, for meteorological transport and dilution, for removal of pollution by the atmosphere, for the effects of various pollutants singly and in combination, and for economic and social implications.

39709 **APTIC NO. 62196**

Pikon, J. and J. Wasilewska

APPLICATION OF BOSANQUET, CAREY AND HALTON S FORMULA FOR CALCULATING THE SPREADING AND FALL OF DUST. *(Stosowanie wzoru Bosanqueta, Careya i Haltona do obliczen rozprzestrzeniania i opadu pylu). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(1):8-17, 1972. 10 refs.*

NTIS: TT 72-54023/1

Analyses were made of the yearly dust emission, the granular and chemical composition of the emitted dusts, and the dust fall in the area of a metallurgical plant. The dust fall was calculated by the Bosanquet, Carey, and Halton formula on a computer and compared with field measurements. An analysis was made of the usefulness of the formula for calculating the spread and fall of dust to the ground. The Bosanquet, Carey, and Halton formula gave similar results for dispersion and dust fall to the field results. Divergence of the results was 20%, a value remaining within the limits of the error of measurement. The formulas can be used to calculate the dispersion of pollutants coming from a single measuring site or from several ones within the test area. It is not possible to gain results which would characterize the value of dust fall coming from the studied source or from a group of sources by taking direct measurements because of the phenomenon of secondary emissions. Moreover, performance of immediate measurements of dust fall in the study area requires much time, exertion, and money. Thus, the Bosanquet, Carey, and Halton formula lends itself for use in obtaining data on the effects produced by a given source on the atmosphere and on the terrain.

39710 **APTIC NO. 62312**

Pikon, J. and J. Wasilewska

COMPARISON OF RESULTS OF CALCULATIONS AND MEASUREMENTS OF THE DISPERSION OF SO2 IN THE AIR. *(Porownanie wynikow obliczen i pomiarow rozprzestrzeniania sie SO2 w powietrzu). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):24-34,1972. 18 refs.*

NTIS: TT 72-54023/2

Methods for studying the distribution of gaseous pollution in the atmosphere are described. A comparison is made of the effect of sulfur dioxide in the air on SO2 concentrations at ground level using Sutton s equation. Based on the results, an estimate is made of the serviceability of the Sutton equation for calculating SO2 concentrations at ground level. Within 1 km of the steelwork, SO2 exceeded the maximum allowable concentration of 0.9 mg/cu m of air. This did not affect the level of contamination in the center of the town in which the plant is located. Even though the steelwork did not enhance the level of pollution in the town center, it did contaminate the atmosphere in the newly developed districts surrounding the plant. The results obtained with Sutton s formula and direct measurements of SO2 were not comparable. The difference between the maximum and minimum concentrations was up to 2250%; the dispersion of results between the average measured value and the mean value calculated was about 360%. Great differences between calculated and measured results were due to highly variable meteorological conditions and to errors of measurements at low concentrations of SO2 in the air. Computer analysis using the Sutton formula can be used to determine the extent and concentrations of pollutants -- provided that the parameters of emission, sources, and weather are known.

39711 **APTIC NO. 62343**

Pruppacher, Hans R.

THY ROLE OF NATURAL AND ANTHROPOGENIC POLLUTANTS IN CLOUD AND PRECIPITATION FORMATION. *In: Chemistry of the Lower Atmosphere. S. E. Rasool (ed.), New York, Plenum, 1972, Chapt. 1, p. 1-67, 315 refs.*

Recent studies in cloud and precipitation physics are reviewed, particularly as they are related to the role of both natural and anthropogenic pollutants. Aerosol particles which are to serve as cloud condensation nuclei (CCN) have to fulfill two major requirements: one with regard to their size, and one with regard to their water affinity. The drop-forming capability of CCN is better in the larger particles. The larger their water solubility, the smaller their wetting angle. The anthropogenic production rate of CCN is only a few percent of the natural production. Continually increasing fuel consumption on a world-wide scale may revise this figure upward. Over densely inhabited and heavily industrialized areas, the anthropogenic production of CCN contributds significantly to the total production. The contribution over the USA is estimated as high as 15%. Only a small fraction of the aerosol particles in the atmosphere serve as ice-forming nuclei (IFN) and only a small percentage seem to be capable of initiating the ice phase in the atmosphere at temperatures warmer than -10 C. Combustion particles may constitute an important source of IFN if the temperature is very low.

39712 **APTIC NO. 62320**

Reiter, E. R. and P. C. Katen

ATMOSPHERIC TRANSPORT OF LEAD. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4 RANN GI-34813X, p. 46-69, 1972. 6 refs.*

NTIS: PB 223623

Some preliminary results are presented of the application of a practical model for describing vertical and downwind dispersion from continuous infinite line sources where particulate lead in automobile exhaust is measured downwind of a straight highway. The measurements of the mean wind profile and vertical profiles of the vertical wind fluctuations were incorporated into a one- dimensional Gaussian distribution to give a non-Gaussian Gaussian distribution in the vertical. In addition, the depletion of particulate lead from gravitational settling was effectively parameterized and incorporated into the dispersion scheme. This model was studied in a field test of the dependence of lead transport on atmospheric turbulent diffusion characteristics downstream from two- and four-lane highways near Fort Collins, Colorado. Wind, turbulence, and lead concentrations were measured. The method was able to predict downwind concentrations by measuring two simple atmospheric variables, wind velocity and vertical wind fluctuations, with no extensive knowledge of atmospheric boundary layer turbulence necessary. (Author abstract modified)

39713 **APTIC NO. 62058**

Rutkowski, J. D.

EFFECT OF THE POSITION IN SPACE OF THE SOURCE OF EMISSION ON DISPERSION OF CONTAMINANTS IN THE GROUND LAYERS OF THE ATMOSPHERE. *(Wplyw usytuowania zrodla emisji na rozprzestrzenianie zanieczyszczen w przyziemnych warstwach atmosfery). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(2):63-69, 1972. 11 refs.*

An analysis was made of data on atmospheric conditions and dispersion in the area around the location of a new plant. Differences are discussed in the dispersion of contaminants within the zone of aerodynamic shade and beyond this zone. Formulas are provided for calculating the values of concentrations of air contamination in the ground layer, in dependence on the location of the level of discharge of contaminants in relation to the aerodynamic shade zone.

39714 **APTIC NO. 62061**

Stachlewska-Bernadt, B.

ATTENUATION OF SOLAR RADIATION SHOWN BY THE EXAMPLE OF ZABRZE. *(Oslabienie natezenia promieniowania slonecznego na przykladzie miasta Zabrza). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(1):41-45, 1972. 7 refs.*

NTIS: TT 72-54023/1

In 1965, simultaneous measurements were carried out of the intensity of immediate solar radiation at Zabrze and at the Voivodship Recreational Park of Chorzow in Poland. Calculations were made of the indicies of opacity at both locations. The values determined the attenuation of solar radiation which penetrates to the earth s surface caused by various factors including dust. The data indicated an increase of opacity at Zabrze by about 20% compared with Chorzow. This was due to increased diffusion and absorption by suspended matter in the more polluted air at Zabrze. Absorption by water vapor was the major cause of attenuation of solar radiation at Chorzow. The values of opacity depended largely on the direction of the prevailing winds, especially in Zabrze.

39715 **APTIC NO. 62832**

Trevino, George

ON THE NATURAL REDISTRIBUTION OF SURFACE CONTAMINATION. *Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, WASH-1225, UC-53, 8p., Nov. 1972. 12 refs.*

GPO

Because any ground-deposited contamination will attach itself to host particles such as soil, the subsequent redistribution of the contamination by the wind will depend upon the wind-induced motion of the hosts. A mathematical model is developed, using power-spectral techniques, which can account for the effects of the wind. Underlying the development is the inherent assumption that only those particles in the soil whose size does not restrain from being moved, directly or indirectly, by the wind, are of primary importance, while those particles which cannot be moved by the wind are of secondary importance. The model is only the first step in the process of predicting the motion of ground-deposited contamination and should be extended. (Author abstract modified)

39716 **APTIC NO. 62326**

Vaitkus, D. R. and H. W. Edwards

MODEL FOR ENVIRONMENTAL TRANSPORT OF AUTOMOTIVE LEAD. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 166-180, 1972. 5 refs.*

NTIS: PB 223623

The development of a model for short-range environmental transport and accumulation of automotive lead is described. Atmospheric transport of lead from a highway and its removal from the atmosphere by gravitational settling, washout, and rainout are coupled to migration and retention in soil. The mathematical model consists of a system of linear, ordinary differential equations which quantitatively interrelate the transport and accumulation mechanisms. Numerical integration schemes are employed to solve the system of equations. Input consists of source characteristics, meteorological parameters, and initial conditions. Output consists of lead concentrations, fluxes, and accumulations as functions of space and time. Preliminary results indicate that the system of equations is well-behaved, and output is consistent with expected system behavior. (Author abstract modified)

39717 **APTIC NO. 62038**

Wanta, R. C.

AN EMPIRICAL APPROACH TO THE SELECTION OF CHIMNEY HEIGHT OR ESTIMATION OF THE PERFORMANCE OF A CHIMNEY. *In: Industrial Environmental Health. The Worker and the Community. Lester V. Cralley (ed)., New York, Academic Press, 1972, p. 455-465. 23 refs.*

An empirical approach is given to the determination of a governing standard for a chimney height which will meet ground-level sulfur dioxide standards of 0.02 ppm maximum annual arithmetic mean, 0.1 ppm 24-hour average not to be exceeded more than 1 day in any 3 consecutive months, and 0.25 ppm 1-hour average not to be exceeded more than 1 hr in any 24-hour period. The approach considers the pollutant concentration, the averaging period, and a frequency which indicates how often such an averaged concentration occurs. The sulfur dioxide emissions from a power plant of moderate size is used as an example, but other pollutants might be similarly treated. The long-term average ground concentration in the most exposed zone is also estimated.

39718 **APTIC NO. 62702**

Young, D. R., C.-S. Young, and G. E. Hlavka

SOURCES OF TRACE METALS FROM HIGHLY-URBANIZED SOUTHERN CALIFORNIA TO THE ADJACENT MARINE ECOSYSTEM. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 21-39. 9 refs. (Oct. 31-Nov. 2.)*

Sources of trace metals in the water around Southern California are described including municipal waste water; discrete industrial discharges; surface runoff; and diffuse sources such as vessel antifouling paint and fuel consumption, ocean dumping, airborne inputs, and advective transport by the California current. Aerial fallout consists of rainfall washout and dry fallout. In one study of the Bight area, an average annual rainfall rate of 40 cm over a Bight area of 100,000 sq km was assumed. The mass emission rate of lead from direct rainfall washout was higher than that from the discrete sources, municipal waste water, and surface runoff. The mass emission rates of nickel and iron were much lower than those from the discrete sources. For copper, mercury, zinc, and manganese, comparable amounts were contributed from rainfall washout and discrete sources. The fallout of lead on dust particles in Bight was two to three times as large as that due to rainfall. This lead was essentially from the combustion of leaded gasoline. Annual lead input rates through dry and wet fallout in the Bight area were 2400 and 1000 metric tons, respectively. Approximately 10,000 metric tons of lead are released annually into the atmosphere in Southern California. As much as 1/3 of this may fall into coastal waters.

39719 **APTIC NO. 61695**

Organisation for Economic Co-operation and Development, Air Management Research Group

MODELLING OF AIR POLLUTION. *In: Air Management Problems and Related Technical Studies. p. 83-86, 93-95, 1972. 41 refs.*

A preliminary statement by a Study Group of Models for Predictions of Air Pollution established to define administrative needs in respect to modeling and to examine the technical feasibility of constructing models in relation to the defined requirements is presented. A simple universal model fitting all situations cannot be expected. Because of the unique topography of each region, models must be based on local data. A major deficiency in present models is the omission of factors relating to physio-chemical transformations and removal processes of pollutants in the atmosphere. Little consideration has been given to prediction of drift and dispersion at various levels in the atmosphere and at great distances. There is a need to develop capabilities for prediction on a mesometeorological scale, which is a prime objective.

39720 **APTIC NO. 61703**

Organisation for Economic Co-operation and Development, Air Management Research Group

REPORT OF AN AD HOC MEETING OF EXPERTS ON THE ACIDITY AND CONCENTRATION OF SULPHATE IN RAIN. *In: Air Management Problems and Related Technical Studies. p. 141-143, 1972.*

The report of an ad hoc meeting of experts on measurements made during the last 10 yr at background stations in 12 Western European countries is summarized. Measurements provided adequate evidence that there had been a significant increase in the atmospheric content of sulfur. There are atmospheric processes which can give rise to transport over long distances of sulfur dioxide and other S compounds. An understanding of the meteorological processes involved is essential if it is to become possible to predict future levels of pollutants and potential effects of long range transport of these pollutants.

1970

39721 **APTIC NO. 59543**

Cappuccio, G., C. Corradini, B. Favale, G. Rocchetti, and G. Tonna

RECOVERY OF FOG MICROPHYSICAL PARAMETERS BY EXPERIMENTAL DATA ON LIGHT SCATTERING. *Preprint, Consiglio Nazicuale delle Ricerche, Rome (Italy), Istituto di Fisica dell Atmosfera, 87p., Nov. 1970. 14 refs.*

NTIS: N72-14645

The problem of determining the fog droplet size spectrum is reviewed, and a light scattering method is presented in detail. Mathematical equations and their limits, the use of an artificial fog chamber for elaborating the experimental data, and an IBM 1130 program for processing the data are presented along with some examples of the results obtained. The method developed permits a rapid determination of the main features of fog size distribution at any time during fog evolution.

39722 **APTIC NO. 62348**

Michael, P., G. S. Raynor, and R. M. Brown

ATMOSPHERIC DIFFUSION FROM AN OFF-SHORE SITE. *Brookhaven National Lab., Upton, N. Y., Rept. IAEA/SM-181/5, Conf-731110--5, 10p., 1970 (?). 5 refs.*

NTIS: BNL 18301

The fate of airborne effluents from a nuclear reactor at an off shore site was analyzed to provide a better understanding of over-water atmospheric dispersion. A diffusion study was made off the south shore of Long Island, N. Y. about 100 km from New York City which used tracer material being released from an anchored boat. Measurements of mean wind, turbulence, and temperature are made on portable towers on the beach, from an aircraft, and aboard the source boat. Plume geometry is documented by photography and from quantitative concentration measurements. Dispersion is very sensitive to meteorological conditions. Over-water dispersion is significantly less than over land, particularly when the on-shore flow is due to the sea breeze. This is due to the low aerodynamic roughness of the water and because low level stable conditions are established because the water is at lower temperature than the air. Crosswind standard deviations of the plume a factor two less than the prediction of Pasquill category F have been observed at the shore with the source 6 km off shore. (Author abstract modified)

1969

39723 **APTIC NO. 62103**

Ferrara, R. and G. Tonna

AIR IONIZATION MEASUREMENTS IN DIFFERENT METEOROLOGICAL AND ENVIRONMENTAL CONDITIONS. *(Misure di ionizzazione dell aria in differenti condizioni meteorologiche e ambientali). Inst. of Atmospheric Physics (Italy); Italian Geophysics Assoc.; and National Council of Research (Italy), IFA-CP-226, 10p., Oct. 1969. 5 refs. (Presented at the Italian Geophysics Association, 18th Meeting.) Translated from Italian. Translation Consultants, Ltd., Arlington, Va., National Aeronautics and Space Administration NASA-TT-F-14408, 8p., April 1972.*

NTIS: N72-27642

Ion concentrations were measured in different meteorological and environmental conditions in the open country, at a polluted site, in fog, and in an artificially conditioned environment. Concentrations of condensation nuclei and extinction coefficients were also measured. The extinction coefficient of fog was measured in an artificially produced fog. At the polluted site approximately 30 km from Rome, the average values of aerosols (N), + ions (n+), cations (n-), and n+/n- were 40,000/cu cm, 640/cu cm, 400/cu cm, and 1.6, respectively. The high average ionization was due to the sparse concentration of polluted nuclei which operated from the capture centers of the ions. This factor was especially evident during the night. During the day, N increased due to increased activity of the sources of natural nuclei, and n+ and n- decreased correspondingly. In Rome itself, these values were 80,000/cu cm, 300/cu cm, 200/cu cm, and 1.2, respectively. Car exhausts increased the N value. Values of n+ and n- were 20 times lower in the case of an artifical fog with an initial concentration of condensation nuclei equal to 100,000/cu cm than in the case of N equal to 20,000/cu cm. In an artificially conditioned environment (a workroom in which the change of air is ensured by an air conditioner), the amount of n- was greater than n+ due to the air conditioner. This caused a n+/n- ratio lower than 0.8, which could cause discomfort.

1965

39724 **APTIC NO. 62040**

Ghelberg, N. W.

MATHEMATICAL AND STATISTICAL METHODS FOR INTERPRETING THE CONCENTRATION OF NOXIOUS CHEMICALS IN THE ATMOSPHERIC AIR. *(Procedee matematico-statistice in interpretarea concentratiei unei noxe chimice din aerul atmosferic). Text in Romanian. Igiena (Bucharest), 14(5):305-311, May 1965. 17 refs.*

The principles necessary for the calculation of arithmetic means are presented in accordance with the local topometeorological situation for use in interpreting the concentration of noxious chemicals in the atmospheric air. The mathematical and statistical methods are useful due to the practical difficulties usually posed during the relatively short periods of sampling, such as the multitude, variability, and complexity of the factors involved in air analyses, as well as the technical problems of collecting a great number of samples. Calculations indicated that their average accuracy varies between 8.5 and 11.7%. Stress is laid on the importance of the standard deviation, variation coefficient, precision of the mean, certainty range of the mean, calculation of the number of analyses necessary to give a degree of certainty of the mean, and their behavior in various situations. The chi squared test is also useful in comparing the various pollution areas of an air basin. Tables illustrate the mathematical statistical interpretation of area means for lead concentrations in the atmosphere of a city with nonferrous chemical industries and the concentrations of lead in various polluted areas compared to the 95% certainty range of the mean of the entire city. The means obtained for lead sampled by aspiration and sampled in sedimentation vessels are considered.

1959

39725 **APTIC NO. 62044**

DeMarrais, Gerald A.

WIND-SPEED PROFILES AT BROOKHAVEN NATIONAL LABORATORY. *J. Meteorol., 16(2):181-190, April 1959. 15 refs.*

Wind-speed profiles are determined for a 114-meter layer and two continuous parts of that layer through the use of data from the 125 m meteorological tower at Brookhaven National Laboratory. Some variations in the profiles can be attributed to differences in wind speed and direction. A comparison of results obtained through the use of the power law and the logarithmic law shows that the power law more accurately fits the data. The profiles determined in this study are in agreement with those found in an independent investigation made at Brookhaven. The results of this investigation are compared with those obtained at ten other locations. (Author abstract modified)

BASIC SCIENCE AND TECHNOLOGY

1974

39726 **APTIC NO. 62607**

Boki, Keito

STUDIES ON THE ADSORBENTS FOR THE ADSORPTION REMOVAL OF HYDROGEN SULFIDE GAS. *(Ryuka suiso gasu kyuchaku jokyo no tame no kyuchakuzai ni kansuru kenkyu). Text in Japanese. Shikoku Igaku Zasshi (Shikoku Acta Medica), 30(2):86-93, April 1974. 18 refs.*

The adsorption of hydrogen sulfide gas on 10 silicates was measured at 1.5 and 30 C at pressures up to 50 mm of mercury by a gravimetric method using a Brunauer Emett Teller apparatus with a spring balance to examine the effectiveness of various adsorbents and conditions on hydrogen sulfide removal. Greater amounts of H2S were adsorbed with higher pretreatment temperatures and longer pretreatment times. Magnesium silicate adsorbents had the highest adsorption capacity and possses the following properties: larger specific surface area, larger heat of adsorption, and negative entropy changes of adsorption. A slight chemisorption of H2S was found on the active sites of the magnesium silicate adsorbents.

39727 **APTIC NO. 62512**

Bruland, Kenneth W., Kathe Bertine, Minoru Koide, and Edward D. Goldberg

HISTORY OF METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE. *Environ. Sci. Technol., 8(5):425-432, May 1974. 10 refs.*

The anthropogenic fluxes of lead, chromium, cadmium, zinc, copper, silver, vanadium, and molybdenum into the sediments of the San Pedro, Santa Monica, or Santa Barbara Basins, off the coast of Southern California are determined. The metals appear to be accumulating at higher rates in the San Pedro and Santa Monica and less distinctly in the Santa Barbara present-day deposits than a century ago. This change can be attributed to the mobilization of these metals by the activities of man. On the other hand, the sediments in the Soledad Basin, off the coast of Baja California, show no concentration changes in these metals as a function of depth. This site, similarly anaerobic, is used as a baseline depositional area, not measurably affected by human activity. Anthropogenic fluxes may be calculated by subtracting the baseline flux, measured 50 or more years ago, from the total flux of the element measured in 1970. The natural fluxes for the Santa Barbara basin are substantially higher for all metals than for the San Pedro, the Santa Monica, or the Soledad deposits, reflecting its higher sedimentation rate. As a consequence, the impacts of man are less evident in the metal concentrations in the Santa Barbara deposits. With the exception of vanadium, the anthropogenic fluxes for the different basins are similar for each element. At the present time it is not possible to evaluated the contributions from different transporting agencies such as wind and storm runoff, although some estimates of the atmospheric contributions can be made.

39728 **APTIC NO. 62398**

Burwell, Robert L., Jr. and Orlando Leal

MODIFIED SILICA GELS AS SELECTIVE ADSORBENTS FOR SULPHUR DIOXIDE. *Chem. Comm., no. 9:342-343, May 8, 1974. 4 refs.*

An unusual chemisorption reaction of sulfur dioxide is described which is selective, reversible, and of potential analytical utility. Because of close molecular analogies, the identity and nature of the adsorption site and of the adsorption complex are much clearer than is usual in chemisorption. Silica gel modified by -CH2CH2CH2NH3 X, where X is chloride, bromide, or iodide, adsorbs the SO2 selectively to form the halogenosulphinate ion SO2X-; the process reverses upon warming.

39729 **APTIC NO. 62499**

Cheremisinoff, Paul H. and Yousuf H. Habib

CONVERT GAS CONCENTRATION TO EMISSION RATE. *Pollut. Eng., 6(4):49, April 1974.*

In most industrial air pollution problems, the concentrations of the contaminants are reported in milligrams per cubic meter (mg/cu m) and the gas flow rate is reported in standard cubic feet per minute (scfm). For compliance with many accepted governmental agency requirements, as well as for design purposes, it is desirable to convert the emission rate of the contaminant to pounds per hour. The nomograph gives the emission rate in pounds per hour when the concentration and flow rates are given in mg/cu m and scfm, respectively. The ranges covered encompass most of the values commonly encountered in industrial applications. Examples of its application are given. (Author abstract modified)

39730 **APTIC NO. 62400**

Diamantis, A. A. and G. J. Sparrow

MODE OF ATTACHMENT OF ADSORBED NITROUS OXIDE. *J. Colloid Interface Sci., 47(2):455-458, May 1974. 15 refs.*

The changes in the infrared spectra of diatomic gases adsorbed on various surfaces are similar to those when the gas becomes coordinated in a transition metal complex. The similarity of the infrared spectra of adsorbed and coordinated nitrous oxide was studied. The bonding of N2O was also determined. In order to determine the mody of attachment of N2O, complexes containing N2O and labeled with nitrogen-15 in the endo- and exo- positions were prepared, and a normal coordinate analysis of the infrared absorptions due to the coordinated N2O was carried out. For N2O coordinated through the nitrogen atom, the calculated force constant for the nitrogen-oxygen bond is similar to or higher than the force constant of the nitrogen-nitrogen bond. Although coordination would be expected to affect the force constants of the bonds in the N2O, it is unlikely that the N-O bond would be strengthened and the N-N bond weakened as much as is indicated by the calculations for the N-linked isomer. The force constants calculated for N2O coordinated through the O atom indicate that the N-N bond is slightly strengthened and the N-O bond is weakened on coordination. The N2O molecule is bonded through the oxygen atom.

39731 **APTIC NO. 62431**

Egerton, T. A., F. S. Stone, and J. C. Vickerman

ALPHA-CR2O3-AL2O3 SOLID SOLUTIONS II. THE CATALYTIC DECOMPOSITION OF NITROUS OXIDE. *J. Catalysis, 33(2):307-315, May 1974. 13 refs.*

The sustained catalytic decomposition of nitrous oxide has been studied over alpha-alumina, alpha-chromic oxide, and a series of solid solutions alpha-CrxAl2-xO3. Activity per chromium ion is very high in the dilute solid solutions and declines with increasing Cr content, attaining an almost constant level between x equals 0.2 and x equals 2.0. The reduced activity in the chromium-rich solutions arises because of the retention of strongly adsorbed oxygen at the surface. A comparison is made between CrxAl2-XO3 and MgCrxAl2-xO4 catalysts. Activity on corundum solid solutions is about one order of magnitude greater than on the spinel solid solutions reported earlier, though the activating influence of the Cr ions is rather greater on spinel solutions. Oxygen retention during reaction is much greater on corundum than on spinel. Activiation energies on the Cr-dilute corrundum samples are approximately 40 kJ/mole less than on the spinel samples, while at the Cr-rich end, they are about the same. (Author abstract modified)

39732 **APTIC NO. 62430**

Farrauto, R. J. and Brent Wedding

POISONING BY SOX OF SOME BASE METAL OXIDE AUTO EXHAUST CATALYSTS. *J. Catalysis, 33(2):249-255, May 1974. 10 refs.*

Many base metal oxide catalysts used for carbon monoxide and hydrocarbon oxidation in automobile exhaust gas are poisoned by sulfur oxides. A study was made of sulfur oxides interaction with several catalysts (copper chromite, copper oxide, cobalt oxide, and commercial copper chromite containing copper oxide) to determine its effect on catalytic activity. Various techniques were used in concert and included infrared spectroscopy, thermogravimetric analysis, differential scanning calorimetry as a measure of catalytic activity, and chemical analysis. The catalytic activity was determined as a function of the amount of sulfur dioxide adsorption at various temperatures, and the specific surface sites were identified. There were at least two different adsorption sites for SO2 on copper chromite. The SO2 adsorbs preferentially on the site most important for CO oxidation. The sites necessary for hydrocarbon oxidation are less affected. No sulfate ions form on stoichiometric copper chromite, in contrast to the other catalysts studied. The extent of regeneration of poisoned catalysts depends on the catalyst composition, and several regeneration methods are discussed. (Author abstract)

39733 **APTIC NO. 62555**

Fischer, Traugott, E.

A NEW LOOK AT CATALYSIS. *Phys. Today, 27(5):23-28, May 1974. 9 refs.*

A brief survey of the role of catalysts, particularly heterogeneous catalysts, in fossil-fuel technology is presented in terms of such processes as coal gasification, coal liquefaction, gasoline production, and desulfurization. Metal catalysts are used predominantly in reactions in reactions involving hydrogen, such as the synthesis of ammonia (catalyzed by iron) and the various hydrogenations and dehydrogenations of hydrocarbons in the production of gasoline. Semiconductors are most active for reactions involving charge transfer, such as oxidation and reduction. Insulators, particularly metal oxides, catalyze the skeletal rearrangement (cracking and isomerization) off hydrocarbons. Methods for measuring the properties of surfaces that are relevant to chemisorption and catalysis are also presented.

39734 **APTIC NO. 62271**

Fluegge, Robert A.

A STUDY OF THE REACTIONS FORMING SINGLET OXYGEN METASTABLES IN OZONE REACTIONS WITH O, NO, AND H (FINAL REPORT). *Calspan Corp., Buffalo, N. Y., Air Force Contract F44620-70-C-0095, AFOSR-TR-73- 1647, Calspan Rept. VC-2967-P-2, 29p., 1974 (?). 32 refs.*

NTIS, DDC: AD 766936

Three reactions were studies to determine their role in causing significant infrared emissions in the night air glow and during intense auroral activity. Each of these three, hydrogen + ozone, nitric oxide + O3, and oxygen + O3 produces insignificant concentrations of the O_2 (a superscript 1 delta subscript g) metastable molecule. The emission at 1.27 micron would not be enhanced in the normal and disturbed atmosphere due to these chemiluminescent reactions. Other mechanisms such as low energy electron excitation or energy pooling processes leading to the formation of singlet oxygen should be studied. The recent developments in infrared detectors and low noise amplifiers should be incorporated into the instrumentation for added sensitivity. (Author summary modified)

39735 APTIC NO. 62554

Glaenzer, K. and J. Troe

REACTIONS OF ALKYL RADICALS IN THE SHOCK WAVE-INDUCED PYROLYSIS OF NITROALKANES. *Ber. Bunsenges. Physik. Chem., 78(2):182-184, 1974. 15 refs.*

Reactions of nitrogen dioxide plus alkyl radicals at high temperatures where thermal decomposition occurs are presented in an investigation of shock wave-induced pyrolysis of nitroalkanes. Nitromethane, nitroethane, primary and secondary nitropropanes, and primary nitrohexane are used as alkyl radical sources. Decomposition occurs in highly diluted argon environments with incident and reflected shock waves over a temperature range of 900-1400 K. The primary decomposition reactions are monitored directly via the light absorption of the decomposing nitroalkanes, and the occurrence of primary decomposition via a carbon-nitrogen bond split is verified by monitoring NO_2 concentrations near 400 nm. The studies are based on investigations of the time dependence of the NO_2 concentration profiles.

39736 APTIC NO. 62540

Goetz, Vernon N., Ajay Sood, and J. R. Kittrell

CATALYST EVALUATION FOR THE SIMULTANEOUS REDUCTION OF SULFUR DIOXIDE AND NITRIC OXIDE BY CARBON MONOXIDE. *Ind. Eng. Chem., Prod. Res. and Devlop., 13(2):110-114, June 1974. 16 refs.*

The simultaneous reduction of sulfur dioxide and nitric oxide by carbon monoxide in tubular flow reactors using dry cylinder gas mixtures was achieved by a developed catalyst test procedure which provided a comparison of the activity and selectivity of several commercial and experimental catalysts. Over 60% conversion of SO_2 was achieved with copper alumina when 12% Cu was impregnated on alumina and calcined at 1000 F. Although iron-alumina and chromium alumina are also active catalysts, an iron chromium catalyst proved 10 times as active as the best copper alumina catalyst tested. (Author abstract modified)

39737 APTIC NO. 62122

Guesten, Hans and Ralph-Dieter Penzhorn

PHOTOCHEMICAL REACTIONS OF ATMOSPHERIC POLLUTANTS. *(Photochemische Reaktionen atmosphaerischer Schadstoffe). Text in German. Naturw. Rundschau, 27(2):56-58, 1974. 16 refs.*

The causes for the Los Angeles smog and its effects on man and environment are reviewed. The photochemical reactions of primary atmospheric pollutants are described in detail. Of the primary pollutants emitted into the atmosphere, only nitrogen dioxide and sulfur dioxide absorb light from the solar spectrum reaching the earth s surface. Photooxidation reactions leading to photochemical smog are solely caused by the photolysis of NO_2 which is induced by solar light. The chain reactions triggered by the O atoms and ozone become very complex through interference by other primary and secondary pollutants of the atmosphere. The various chain reactions and the reaction of SO_2 are described. The products of photochemical smog include formaldehyde, acetaldehyde, acrolein, ketones, alcohols, epoxides, organic nitrates, nitrates, and peroxyacrylnitrate compounds. The stationary concentrations of the most important primary radicals and reactive molecules are graphically illustrated. For efficient measures to prevent smog, the physical and chemical processes of photochemical smog formation in certain areas must be fully known. A mathematical model is presented which gives a satisfactory reproduction of measured diurnal concentrations. Such models are not only important for smog control but also for discriminating between tolerable and toxic environmental pollution. For achieving this goal, exact long-term measurements of primary and secondary atmospheric pollutants over large geographical areas must be taken. In the laboratory, more and better input data for the mathematical models must be measured.

39738 APTIC NO. 62579

Hiramatsu, Kinji

PYROLYTIC GASES OF LINSEED OIL. *(Amaniyu no netsu bunkai seisei gasu ni tsuite). Text in Japanese. Preprint, Osaka Prefectural Industrial Research Inst. (Japan), p. 23-24, May 1974. (Presented at the Osaka Prefectural Industrial Research Institute Study Meeting, Osaka, Japan, May 29, 1974.)*

The formation of acrolein from linseed oil used in foundries was investigated to study the problem of poisonous pyrolytic gases. For the pyrolysis test, 5 g of linseed oil placed in a quartz pyrolysis tube containing 120 ml of air was heated at 100, 150, 200 and 250 C for 3 hr. The pyrolyzates were determined by mass analysis and colorimetry. The rate of acrolein formation increased with the temperature elevation in the range of 100 to 250 C, particularly 200 to 250 C. The amounts of acrolein produced at 100, 150, 200 and 250 C were 0.021, 0.023, 0.027 and 0.095 mg, respectively. The linseed oil is used in the foundry at temperatures in the vicinity of 250 C, where the rate of acrolein formation increases rapidly. The possibility of lowering the temperature used in foundries should be explored.

39739 APTIC NO. 62420

Kashiki, Masayuki, Seigo Yamazoe, Naganori Ikeda, and Shozo Oshima

DETERMINATION OF LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY WITH A CARBON ROD ATOMIZER. *Anal. Letters, 7(1): 53-64, 1974. 11 refs.*

The use of a carbon rod atomizer for the analysis of small amounts of lead in gasoline is described. Variables affecting sensitivity include: type of lead salts and type of solvent for standard, sample preparation, and atomizing temperature. A serious problem in the analysis of gasolines for tetraalkyl lead additives by atomic absorption spectrometry is that different lead compounds show different absorbances. This problem can be avoided by the addition of halogen or halides to the gasoline solutions diluted with methyl isobutyl ketone. A standard method for atomic absorption spectroscopy with a carbon rod atomizer system for lead is described. The detection limit is 0.001 ppm Pb.

39740 APTIC NO. 62801

Lahaye, J. and G. Prado

FORMATION OF FINELY DISPERSED CARBON PARTICLES FROM A GASEOUS PHASE. NUCLEATION PHENOMENON. *(Formation de particules de carbone finement divisees a partir d une phase gazeuse. Phenomene de nucleation). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 15-1-15-13. 35 refs. (May 8-10.)*

Studies on the formation of finely dispersed carbon particles from gaseous hydrocarbons in the presence or absence of oxygen are reviewed. Pyrolytic carbon formed on the surface and pulverulent carbon (soot or carbon black) formed in the gaseous phase are generated both in the presence and in the absence of oxygen. Precursor nuclei of carbon black are formed in the course of thermal decomposition by physical nucleation (homogeneous or from ions) of polycyclic aromatic hydrocarbons that were formed during the complex reactions that, in the case of flame, generate polyacetylenes. The liquid microdroplets coagulate and ultimately result in a solid particle by dehydrogenation and reorganization.

39741 **APTIC NO. 61797**

Nishimura, Yusaku, Shoji Kubota, Hisao Yamashita, and Fumito Nakajima

REDUCTION CATALYST FOR AUTOMOBILE NITROGEN OXIDES. (REPORT 2): PROPERTIES OF RU CATALYSTS. *(Jidoshayo NOx kangen shokubai (dai2ho), Ru shokubai no tokusei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 669, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G05.)*

The properties of ruthenium catalysts for nitrogen oxides reduction were examined. Exhaust gases from a small gasoline engine similar to an actual car were passed through a quartz reaction tube packed with catalysts and the catalytic layer was heated up to 600 C. The changes in the nitric oxide reduction rate were examined. The composition of the exhaust gas was 1000-3000 ppm of NO, 0.5-5% of carbon monoxide, and 300-600 ppm of hydrocarbons. With the increase of CO concentration, the NO reduction rate increased, but ammonia formation also increased, probably due to the increase in hydrogen concentration resulting from water gas reaction increase with CO. The optimum CO concentration was about 1%, which reduced NO sufficiently and yet did not form NH3. NO concentration did not affect the reduction activity of NO when there was enough CO. Oxygen concentration was drastically affected by NO reduction activity, and when CO/O2 ratio was greater than 1, activity decreased very much. Ruthenium has considerable oxidation activity. By controlling CO at a low concentration, it is possible to treat NO, CO, and HC simultaneously by Ru catalyst.

39742 **APTIC NO. 62482**

Pelton, Arthur D., J. Bruce See, and John F. Elliott

KINETICS OF EVOLUTION OF SO2 FROM HOT METALLURGICAL SLAGS. *Met. Trans., 5(5):1163-1171, May 1974. 5 refs.*

The kinetics of the evolution of sulfur dioxide gas from a liquid synthetic blast furnace-type slag (calcium oxide-alumina-silica) in an atmosphere of oxygen and argon gas at a total pressure of 1 atm for 0.003 is less than or equal to PO2 is less than or equal to 1.00 atm has been studied in the range 1360 to 1460 C. The process has been followed by collecting and analyzing the SO2 as it forms, and also by observing the change in weight of the slag sample with time. The effect of slag composition has also been studied. For partial pressures of oxygen less than about 0.1 atm, the rate is very rapid and is controlled by transport in the gas phase. At greater values of PO2, the rate is much slower and is controlled by a chemical process. In the high PO2 region, the process is half-order with respect to the concentration of sulfur in the slag. This half-order dependence on sulfur concentration in the slag may be explained by an initial fast irreversible reaction to form two intermediate species which then decompose at equal rates to give the final products. Additions to the slag of iron or manganese oxides greatly accelerate the rate of evolution of SO2 at PO2 of 1.00 atm. This is interpreted to mean that a charge transfer process, possibly involving S2- and O2- ions, is rate controlling at PO2 of 1.00 atm. It is also apparent that Fe2(+) and Fe3(+) (or Mn2(+) and Mn3(+)) ions can act as charge carriers. Some measurements with actual industrial blast furnace slags are also reported. (Author abstract)

39743 **APTIC NO. 62544**

Ross, Robert A. and Michael J. Jeanes

OXIDATION OF HYDROGEN SULFIDE OVER COBALT MOLYBDATE AND RELATED CATALYSTS. *Ind. Eng. Chem. Prod. Res. Develop., 13(2):102-105, June 1974. 10 refs.*

The oxidation of hydrogen sulfide at concentrations below 4000 ppm by cobalt molybdate and related catalysts was investigated. The effect of oxygen concentrations up to 4.3% and water vapor concentrations up to 12% is described. Cobalt molybdate and mixtures of Co and Mo oxides supported on alpha-alumina were the most effective catalysts and at 250 C allowed the reduction of H2S to levels below its odor threshold, provided that the initial concentration of H2S did not exceed 1000 ppm. The effect of sulfiding on catalyst activity was examined and a possible method for regeneration is described. (Author abstract modified)

39744 **APTIC NO. 61893**

Sano, Hiroshi

NITRIC OXIDE FORMATION MAP, (REPORT 1): THE EFFECTS OF CARBON PARTICLE SIZES ON NO FORMATION. *(NOx hassei chizu (Daiipo) NO seisei e no tanryu koka). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 678, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1973, Paper 1G23.)*

A calculation without taking into consideration of the reaction rate showed that nitric oxide concentration was remarkably high during combustion. The equilibrium-concentration diagram obtained from this calculation gave an NO concentration of 1000 ppm at a flame temperature of 1300 C and an oxygen concentration of 5%, while the actual concentration was 300-600 ppm. An NO formation diagram was prepared by considering the reaction rate and time of stay additionally. As the time of stay decreased, the high NO zone shifted to a high flame temperature area. Calculations also showed that the closeness of combustion curves to the high NO zone was in the following order: methane, kerosene, A heavy oil, C heavy oil, and coal, which is quite contrary to the actual order of NO formation since it did not show heteroneousness of temperature. The actual NO formations are in the order of coal, C heavy oil, A heavy oil, kerosene, CH4, methanol, and hydrogen which is consistent with the order of carbon particle formation.

39745 **APTIC NO. 62283**

Stein, Andrew M., John G. Sullivan, and Francis W. Murray

PHYSICAL MODELS OF FIRES AND THEIR ASSOCIATED ENVIRONMENT. *Preprint, American Inst. of Aeronautics and Astronautics, 25p., July 1973. 9 refs. (Presented at the Aerospace Sciences Meeting, 13th, Jan. 30-Feb. 1, 1974.)*

NTIS: N74-10862

Analytical models for fires are described for predicting and studying the dynamics of flow and for studying the production and distribution of pollutants from combustion or photochemical reactions. The general model is presented considering turbulence, variables conserved in molecular collisions, and radiative transfer. A thermal convection model is described which ignores radiative transfer and treats fluid consisting only of air, water vapor, and condensed drops. Advantages and disadvantages of the models are described. With further development of the models, numerical simulation of fires and their associated environments for more realistic conditions is a promising analytical tool.

39746 **APTIC NO. 61891**

Suzuki, Shin, Nobutoshi Horiuchi, Susumu Kowada, and Wataru Anto

PHOTOCHEMICAL REACTION OF SULFUR DIOXIDE AND ORGANIC COMPOUNDS (5). (Aryusan gasu to yuki kagobutsu tono kokagaku hanno). Text in Japanese. Preprint, Japan. Chemical Society Tokyo, p. 683, 1974. (Presented at the Japan. Chemical Society, Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G28.)

A study of the photochemical reaction of sulfur dioxide-cis-2-butene-oxygen was conducted to determine the reaction mechanism. Sulfur dioxide and O2 were passed through a glass tube irradiated with a high pressure mercury lamp followed by the introduction of cis-2-butene. The same operation was carried out by passing SO2 and cis-2-butene through the tube followed by the addition of O2. The resulting products were trapped in an U-shaped-tube, cooled in liquid nitrogen, and the components were analyzed by gas chromatography using a flame ionization detector. The aldehydes were analyzed by 2,4-dinitro-phenylhydrazine method. The chromatogram showed the formations of methane, acetaldehyde, acetic acid, and others. The formation of peroxide is intermediate from an excited O2 molecule and cis-2-butene for the first reaction and the same peroxide is intermediate from an excited cis-2-butene molecule and O2 for the second reaction.

39747 **APTIC NO. 59631**

Vikesland, John P. and S. J. Strickler

THE 3B1-1A1 TRANSITION OF SO2 GAS. I. FRANCK-CONDON TREATMENT AND TRANSITION MOMENTS. *J. Chem. Phys., 60(2):660-663, Jan. 15, 1974. 13 refs.*

The absorption and emission spectra for the 3B1-1A1 transition in sulfur dioxide gas are reported and subjected to a Franck-Condon type of analysis. The transition moment varies rapidly with bond angle, and a modification of the usual Franck-Condon factors is necessary to deal with this case. The bond length and angle of the excited state are calculated to be 1.491 + or - 0.002 A and 126.1 + or - 0.1 deg, respectively, in good agreement with values from rotational analysis. The oscillator strength of the absorption band is estimated to be 3.34 + or - 0.12 times 10 to the -7th power. (Author abstract)

39748 **APTIC NO. 62331**

Wang, Victor K. and John Overend

THE ANDERSON INTRAMOLECULAR POTENTIAL-ENERGY FUNCTION. I: APPLICATION TO SO2, NO2 AND O3. *Spectra Chim. Acta, vol. 30A:237-247, 1974. 20 refs.*

The application of the Anderson intramolecular potential energy function to sulfur dioxide, nitrogen dioxide, and ozone is described. Anderson proposed a very simple anharmonic potential energy function which appears to model successfully the general quartic force yield of linear tiratomic molecules. This potential function may be extended to bent triatomics and eventually to large molecules. In the form of appropriate for symmetric bent triatomics the potential energy contains two adjustable parameters and these have been determined for SO2, NO2, and O3 by least squares adjustment of the spectroscopic data. The experimental data for SO2 are better and more extensive than those for the other two molecules. The force fields so determined have been examined and compared with previous estimates of the force fields of these molecules. (Author abstract modified)

39749 **APTIC NO. 61833**

Watari, Shinjiro

MANUFACTURING AND EFFECTIVE UTILIZATION TECHNIQUES OF ACTIVE CARBON. *(Kasseitan no seizo to yukoriyo gijutsu ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(4):37-43, April 1974.*

Problems in the economical manufacture of active carbon for use as an adsorbent of environmental pollutants are outlined. Powdered active carbon is produced from scarce and expensive raw materials and should be replaced by granular activated carbon which has a longer service life and can be regenerated. Economical mass production of the several thousand tons of activated carbon needed today would involve a change in the raw materials, a modification in the manufacturing process, and expansion in the production scale. Because charcoal, the most common raw material for active carbon, is becoming rare, coal, petroleum oil pitch, waste plastics, and waste rubber are being considered. An economical manufacturing process for active carbon from coal uses a disk-type granulating machine which operates at room temperature. Bituminous coal is pulverized, mixed with a caking agent (usually sulfite pulp waste liquor) and water, and granulated. A manufacturing process for active carbon using oil pitch as the raw material is also described.

39750 **APTIC NO. 62422**

Wedding, James B. and James J. Stukel

OPERATIONAL LIMITS OF VIBRATING ORIFICE AEROSOL GENERATOR. *Environ. Sci. Technol., 8(5):456-457, May 1974. 5 refs.*

The relationship between the aperture diameter and the operating frequency for monodisperse vibrating orifice aerosol generators is discussed. The previously reported range of 3.5 less than or equal to (disturbance wavelength/jet diameter) less than or equal to 7.0 for monodisperse aerosol generation, is not applicable for all generator aperture diameters. Results are presented denoting the range of wavelength/jet diameter values for which monodisperse aerosols are generated with varying generator aperture sizes. (Author abstract modified)

39751 **APTIC NO. 61706**

Wu, C. H. and H. Niki

A CRITICAL EVALUATION OF METHODS FOR MEASURING THE NO2 PHOTODISSOCIATION RATE: APPLICATION TO SMOG CHAMBER STUDIES. *Preprint, Ford Motor Co., Dearborn, Mich., Fuel Sciences Dept., 31p., 1974 (?). 28 refs.*

Methods for the determination of the photodissociation rate of nitrogen dioxide were critically evaluated for application in smog studies. The kinetics and mechanism of NO2 photolysis at ppm levels in 760 torr nitrogen or air were studied in detail using a 45 liter bell jar reactor. Concentration time profiles of the reactant NO2 and the products nitric oxide and ozone were monitored continuously by the NO-O3 chemiluminescence method. The decay of NO2 in N2 deviated from first order behavior, this being most noticeable in the early stages of photolysis when the yield of NO is less than a few percent. Thus the commonly used k subscript d method, which is based on the assumption of first order decay is not applicable. Alternative kinetic expressions were derived and validated, and values of the relevant rate constant ratios are obtained. In the photolysis of NO2 in air, the attainment of a photodissociation rate can be determined from this relation. Data obtained under various conditions have been analyzed in terms of an 11-step mechanism using numerical integration techniques. A set of rate constants has been derived which can adequately describe the photolysis of NO2 at ppm level either in N2 or air.

39752 **APTIC NO. 61883**

Yamazaki, Masahiko

REGENERATION TECHNIQUES OF ACTIVE CARBON. *(Kasseitan no saisei gijutsu). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(4):44-50, April 1974. 10 refs.*

Regenerative processes for active carbon include the heating method, the steam method, the dissolution extraction method, the biological oxidation method, the acid-scrubbing method, and the chemical oxidation method. The heating or thermal regeneration method usually consists of three main processes which are drying, baking, and activation. In the drying process, the used active carbon is heated at 20-100 C to evaporate the water content in its pores, while the volatile contents of the organics adsorbed by the active carbon are evaporated at 100-820 C in the baking process, thereby carbonizing the adsorbed substances. In the activation process, the adsorbed substances carbonized in the baking process are removed and the active carbon then reactivated, using combustion gas and steam. The temperature of the active carbon at this stage is 820-900 C. The thermal regeneration of active carbon is carried out by a multi-stage furnace, a rotary kiln, a fluidized bed furnace, or a transport reactor. The typical construction and/or basic flow sheet of each piece of equipment or plant are shown together with the standard operating conditions or requirements. The regeneration cost of powdered active carbon is compared between the multi-stage furnace and the fluidized bed furnace. The unit regeneration cost is higher in a smaller-scale plant in both categories of the furnace according to the data cited. The total regeneration cost/lb is 5.7 cents for a two tons/day capacity plant, 3.3 for the 10 tons/day, and 2.8 for the 30 tons/day, in the case of the multi-stage furnace. Costs are 9.0, 6.5, and 6.2 cents in the fluidized bed furnace.

39753 **APTIC NO. 62854**

Yeung, Columba K. K. and Colin R. Phillips

ESTIMATION OF NO PHOTOOXIDATION REACTIVITIES OF OLEFINS FROM MOLECULAR STRUCTURE. *Atmos. Environ., 8(5):493-506, May 1974. 11 refs.*

Olefins are the most reactive class of hydrocarbons in smog formation. A simple model has been developed for estimating their reactivities (expressed as rate of formation of nitrogen dioxide). An olefin is composed of two structural groups joined by the double bond. Each structural group can be characterized by a rate factor for a given set of experimental conditions. The reactivity of the olefin is given by the product of the corresponding rate factors. Using data by Glasson and Tuesday (1970), it has been verified that rate factors derived from one set of olefins can be used successfully for predicting the reactivities of a different set of olefins. Predicted and measured reactivities agree well and have a corelation coefficient of +0.998. From N different structural groups, it is possible to predict the reactivities of N(N+1)/2 olefins. Rate factors can also be estimated from known rate factors of similar structural groups (different in carbon number), further increasing the number of possible predictions. (Author abstract)

39754 **APTIC NO. 61882**

Yusuoka, Takashi and Yumei Mitsuzawa

REDUCTION OF NITROGEN DIOXIDE TO NITRIC OXIDE. *(NO2 no NO e no kangen). Text in Japanese. Preprint, Japan Chem. Soc., Tokyo, p. 670, 1974. (Presented at the Japan Chemical Society Spring Meeting, 30th, Higashi-Osaka, Japan, April 1-4, 1974, Paper 1G06.)*

Nitrogen dioxide was reduced to nitric oxide in a quartz tube packed with 10 g of soil, quartz powder prepared by vacuum melting and the Bernuis method, and rock crystal at 50-400 C. A sample gas containing 5 ppm of NO2 was passed through the catalyst and the resulting gas was analyzed. More than 50% of NO2 was reduced by all of the four catalysts at temperatures higher than 300 C. Soil showed the highest conversion rate at approximately 95% while quartz powder prepared by the vacuum melting method gave the lowest rate. The considerable difference between the two types of quartz powder was due to their difference in moisture content. The life of the soil catalyst was about 30 to 40 hr at these conditions.

39755 **APTIC NO. 62874**

Zellner, Reinhard and Ian W. M. Smith

RATE CONSTANTS FOR THE REACTIONS OF OH WITH NH3 AND HNO3. *Chem. Phys. Letters (Amsterdam), 26(1):72-74, May 1, 1974. 10 refs.*

The rate constant of the reaction, hydroxyl radical + ammonia yields water + amino radical was measured at temperatures between 230 and 490 K using time-resolved resonance absorption to observe the concentration of OH radicals. An Arrhenius expression, kl equals 2.3 times 10 to the -12th power exp (-1.6 kcal/mole/RT)cu cm/molecule/sec, was obtained. Similar experiments, between 240 and 405 K, were carried out on OH + nitric acid yields H2O + nitrate, and k3 equals (0.9 + or - 0.2) time 10 to the -13th power cu cm/molecule/sec throughout this range of temperature. Reactions of the hydroxyl radical play an important role in combustion and in the chemistry of the lower and upper atmosphere. (Author abstract modified)

1973

39756 **APTIC NO. 62635**

Appleton, John P.

SOOT OXIDATION KINETICS AT COMBUSTION TEMPERATURES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 20-1-20-11. 33 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Comparisons between soot oxidation rate measurements obtained in laboratory flames and in a recent shock tube investigation are made with previously reported measurements of the surface oxidation rate of bulk samples of pyrolytic graphite. The surface oxidation rate mechanism for soot and pyrolytic graphite are the same and the rates are predicted by a semi-empirical expression, originally proposed by Nagle and Strickland-Constable for graphite oxidation, which expresses the specific surface oxidation rate in terms of the surface temperature and the gas-phase partial pressure of oxygen. This expression provides a method of estimating soot oxidation rates suitable for use in engineering design and performance studies of practical combustion systems such as gas turbine combustors. (Author summary modified)

39757 **APTIC NO. 62630**

Bailey, D. L., P. W. Tower, and A. E. Fuhs

POLLUTION CONTROL OF AIRPORT ENGINE TEST FACILITIES. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 14-1-14-32. 118 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The essential characteristics of the jet engine test facilities to be constructed during the 1970s are identified and the techniques available to meet these requirements are summarized. Engine test facilities are required to meet the same environmental standards as any other industrial facility. To meet the standards for smoke, noise, and gaseous pollutants, control equipment must be installed. Due to large mass flow rates, the control equipment is expensive and careful attention to design is necessary to control costs. Pollution control forces new constraints on exhaust stack temperature, flow uniformity, and pressure. Conversely, installation of pollution abatement apparatus may cause adverse operating conditions such as distorted flow into the engine and wrong augmentation ratio. The internal aerodynamics of engine test cells must be mastered to a level not possible previously. Scale models (1:24) of test cells were fabricated in modules so that some 750 different combinations could be tested. Distortion at the engine face was measured and correlated in terms of component factors. Augmentation ratio and cell depression were measured. An analytical model correctly-predicted the measured quantities except for distance from engine nozzle to augmenter inlet. With the data accumulated it should be possible to match pollution control requirements to test cell parameters. (Author summary modified)

39758 **APTIC NO. 62640**

Casci, C., A. Coghe, U. Ghezzi, and S. Pasini

AN EXPERIMENTAL RESEARCH ON THE BEHAVIOR OF A CONTINUOUS FLOW COMBUSTION CHAMBER. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 26-1-26-11. 15 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

A continuous flow test bench was developed to study gas turbine combustion. The feeding system provides a wide range of air-fuel ratios (AFR) and working pressures to investigate different test conditions. The combustion chamber is arranged to sample gas composition in different positions and to measure other magnitudes such as pressure, air, and fuel mass flow rate. The species analyzed were carbon monoxide, unburned hydrocarbons, and nitrogen oxides. As far as CO and hydrocarbons are concerned, an increase in pressure brings reduced emissions or increased thermal levels. Nitric oxide emissions are monotone versus pressure and AFR. A pressure increase results in higher NO emissions, while an AFR increase reduces NO emissions. Nitric oxide formation is controlled mainly by temperature levels which are correlated to the mixture formed in the primary zone. The primary concern in the analysis was the evolution of the above species along the can-type liner and the determination of the most opportune working conditions. The typical design features of the combustion chamber allows reasonable applications of experimental data to real systems, but the kinetic and fluidodynamic phenomena concerned with combustion processes make extrapolation of these results to other situations difficult. (Author summary modified)

39759 **APTIC NO. 62930**

Dunskiy, V. F.

SYMPOSIUM ON AEROSOLS. *Zashch. Rast. (Moscow), no. 3:57, 1971. Translated from Russian by Charles T. Ostertag, Jr., Wright Patterson AFB, Ohio, Foreign Technology Div., 7p., Aug. 20, 1973.*

NTIS, DDC: AD 766571

Papers presented at a symposium on the application of aerosols in agriculture which took place in Moscow, Nov. 3-4, 1970 are briefly described. The topics include: current state of development of the science of aerosols; use of aerosols in medicine, veterinary work, and sanitation; mathematical methods for the calculation of wind drift of a pesticide to neighboring fields; problems of automation of the spraying processes; development of new gamma pesticide house pots for insect extermination in warehouses; and liquid preparations and the reduction of the drift of pesticides during aerial spraying; problems of the theory, calculation, design, and use of orchard and vineyard sprayers; the calculation, design, and use of experimental microvolumetric sprayers; the testing of airborne equipment for the application of granulated chemicals; and the mechanism of the toxic effect of a highly dispersed condensed aerosol on insects.

39760 **APTIC NO. 62632**

Eberius, K. H. and T. Just

NO FORMATION IN FUEL RICH FLAMES: A STUDY OF THE INFLUENCE OF THE HYDROCARBON STRUCTURE. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 16-1-16-8. (April 9-13.)*

NTIS, DDC: AD-769 278

The formation of nitric oxide in premixed propane, ethylene, and acetylene flames at 1 atm has been measured. Large concentrations of NO were found in very fuel-rich flames. The NO formation in flames could reasonably be separated into three classes: Zeldovich mechanism with equilibrium oxygen atom concentration; Zeldovich mechanism with the remaining excess O2 atom concentration; and other reactions involving radicals as CH, C, and C2. The distinction of these classes can be made by studying the temperature dependence of the NO formation, by analyzing the curvature of the NO profiles, by relating the rate of NO formation to O2 atom concentrations, and by measuring hydrocyanic acid in some flames. The analysis of the temperature dependence of the NO formation in propane flames gave evidence, that in these flames with stoichiometric ratios between 1.2 and 1.4, and temperature between 1850 K and 2400 K, reaction class is the main reaction channel with the analytical formation for the NO produced in these flames. A comparison of flames which have the same temperature at the same mixture strength, but differ in the chemical structure of the fuel, shows higher NO concentrations for acetylene flames and somewhat smaller NO concentrations for methane flames relative to the concentrations in propane flames. (Author summary)

39761 **APTIC NO. 61625**

Frie, W.

GAS COMPOSITION, CALORIFIC VALUE AND THERMAL EFFECT IN THE CRACK GAS REACTION. *(Gaszusammensetzung, Heizwerte und Waermetoenung der Spaltgasreaktion). Text in German. Siemens Forsch. Entwicklungsber., 2(1):63-66, 1973. 7 refs.*

A theoretical study of the gas composition, calorific values, and thermal effects occurring during the cracking of air-gasoline and air-exhaust mixtures used for spark ignition engines is presented. The volume of crack gas obtained from gasoline- exhaust gas reactions is larger than that obtained from the air-gasoline crack reaction. The variations in the rate of soot formation as a function of the air-excess coefficient and of temperature were studied. Thirty different components, such as methane, ethane, propane, butane, octane, and heptane isomers, acetylene, ethylene, propylene, propadiene, hydrogen, carbon dioxide, carbon monoxide, formaldehyde, acetonitrile, ammonia, oxygen, nitrogen, water vapor, and soot with their respective calorific values were considered for the thermodynamic equilibrium calculations.

39762 **APTIC NO. 62662**

Garvin, David

CHEMICAL KINETICS DATA SURVEY. IV: PRELIMINARY TABLES OF CHEMICAL DATA FOR MODELLING OF THE STRATOSPHERE (INTERIM REPORT). *Dept. of Commerce, Washington, D. C., National Bureau of Standards, Dept. of Transportation Proj. 3160409, Rept. NBSIR 73-203, 98p., May 1973. 131 refs.*

NTIS: COM-73-11288

Chemical kinetic and photochemical data for gas phase reactions pertinent to the chemistry of the stratosphere are presented in four tables which give recommended values and also cite recent experimental work. Data are tabulated for the following subject areas: chemical reactions and photochemistry of neutral species, energy transfer reactions, high temperature air reactions, and ion-molecule reactions. The tables are designed for use in modeling of the stratosphere and are being distributed for interim use and for criticism by kineticists. (Author abstract modified)

39763 **APTIC NO. 62288**

Hales, Jeremy M., James O. Wilkes, and J. Louis York

THE APPLICATION OF IDEAL REACTORS TO STUDIES IN ATMOSPHERIC CHEMISTRY. *Battelle Memorial Inst., Pacific Northwest Labs., Richland, Wash., Atmospheric Analysis Section, Atomic Energy Commission Contract AT(45-1):1830, Rept. BNWL-1773, UC-11, 41p., Aug. 1973. 123 refs.*

NTIS: BNWL-1773

Mass-transfer effects and surface reactions may severely obscure the observathon of homogeneous chemical reaction rates from experimental reactor data. Such problems are particularly pertinent to studies in the atmospheric sciences, owing to the tendency for increased surface-reaction interference at the low concentrations usually of interest. Criteria are presented for ideal behavior in basic types of experimental reactors: ideal batch reactors, ideal backmix reactors, laminar flow tubular reactors, and ideal tubular reactors. Under conditions for satisfying these criteria the effects of competing surface reactions can be accounted for quantitatively, allowing the true homogeneous effect to be observed. Data from tubular reactors can be analyzed accurately even under some nonideal conditions. The available solutions to tubular reactor models useful for this purpose have been compiled and are tabulated. The material is useful in providing more systematic bases for experimental reactor design and the analysis of future reaction rate data. (Author abstract)

39764 **APTIC NO. 62330**

Hampson, Robert F., ed.

CHEMICAL KINETICS DATA SURVEY. VI: PHOTOCHEMICAL AND RATE DATA FOR TWELVE GAS PHASE REACTIONS OF INTEREST FOR ATMOSPHERIC CHEMISTRY (INTERIM REPORT). *National Bureau of Standards, Washington, D. C., Physical Chemistry Div., Dept. of Transportation Climatic Impact Assessment Program Proj. 3160409, 3160520, NBSIR 73-207, 128p., Aug. 1973. 147 refs.*

NTIS: COM-73-11862

Photochemical and rate data have been evaluated for 12 gas phase reactions of interest for the chemistry of the stratosphere involving oxygen, nitrogen, and hydrogen compounds. The results are presented in data sheets, one for each reaction. For each reaction the data are summarized. A preferred value is given for the rate constant or the primary quantum yield and photo-absorption cross section. (Author abstract modified)

39765 **APTIC NO. 61906**

Herrmann, G.

CONTINUOUS PRODUCTION OF MIXTURES OF AIR AND ORGANIC SOLVENT VAPORS IN THE PPM RANGE. *(Kontinuierliche Herstellung von Mischungen aus Luft und organischen Loesungsmitteldaempfen im ppm-Bereich). Text in German. Z. Ges. Hyg. Ihre Grenzgebeite (Berlin), 19(11):787-791, 1973. 19 refs.*

For the production of mixtures of air and organic solvent vapors for the purpose of testing analytical methods the diffusion of organic solvents through cartridges of soft polyethylene over a period of 500 days was determined. At 20 C and 0.5 mm thick walls diffusion rates of 0.6 to 25,000 micrograms/h sq cm were obtained. Carbon disulfide and hydrogen chloride diffuse very well followed by benzene and homologues and ether. Ketones have a lower diffusion rate, and alcohols and dimethylformamide hardly diffuse at all. The diffusion rates remained constant up to 200 days. Throulh variation of the cartridge urface, the flow speed, and other parameters, solvent vapor and air mixtures spanning a wide concentration range from maximum allowable emission concentrations to maximum allowable working place concentrations can be obtained. A special advantage of the method is the production of multi-component mixtures. The cartridges are obtained by taking soft polyethylene hoses with a diameter of 5mm which are welded to 6.5 cm cartridges containing 1 ml of the solvent vapor to be tested.

39766 **APTIC NO. 62127**

Hiraoka, M., Y. Ikeda, and T. Imagawa

NUMERICAL SOLUTION OF PHOTOCHEMICAL REACTION EQUATION. *(Kokagaku hanoshiki no suchi kaiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3): 567, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 290.)*

Numerical solutions were found for 15 chemical reactions including the reaction of the hydroxide radical with carbon monoxide. The initial concentrations of nitrogen dioxide, nitric oxide, hydrocarbons, and CO were set at 0.088 ppm, 1.61 ppm, 3.29 ppm and 5 ppm, resepectively, and those of other chemicals were set at zero. The calculations were carried out at various time differentiations. Possible mathematical errors are discussed.

39767 **APTIC NO. 62634**

Holderness, F. H. and J. J. Macfarlane

SOOT FORMATION IN RICH KEROSINE FLAMES AT HIGH PRESSURE. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisory Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 18-1-18-9. 6 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

Model combustor experiments are summarized in which soot formation was measured in a reaction kerosene/air flame of uniform composition. Operating conditions are 6-21 bar and equivalence ratio 0.8 to 1.8. Chemical equilibrium was not attained for equivalence ratios much above unity. The available oxygen reacted initially with a portion of the fuel, the remainder appearing as pyrolysis product. The total amount of this material, including soot, was roughly dependent on the equivalence ratio, independent of other variables. The fraction fully degraded to soot increased sharply on raising pressure from 6-11 bar. There was a well-defined threshold of soot formation at equivalence ratio 1.3 to 1.4 in premixed flames. Soot was observed at weaker conditions than this in spray flames and the formation rate rose to approximately 10% of the input carbon at equivalence ratio 1.8. (Author summary modified)

39768 **APTIC NO. 62383**

Ito, Masayuki, Satoshi Kadowaki, and Setsuko Kadowaki

DETERMINATION OF SULFUR IN HEAVY OILS BY A RAPID ANALYTICAL DEVICE. *(Jinsoku teiryo sochi ni yoru juyu-chu ioubun no sokutei ni tsuite). Text in Japanese. Aichi-ken Kogai Chosa Senta Shoho (Rept. Environ. Pollut. Res. Cent., Aichi Pref.), no. 1:23-27, March 1973. 6 refs.*

The isotope method using infrared absorption and the coulometric method using high frequency wave combustion and electrolysis are simple, rapid, accurate methods for the determination of sulfur in heavy oils. Both methods give values within the standard error. Infrared spectometry gave a better reproducibility than coulometry, especially when the sulfur content of the residual oil is either inordinately high or low.

39769 **APTIC NO. 62163**

Ito, T., T. Kato, H. Kachi, and Y. Hanai

SURVEY RESEARCH OF CAUSE OF PHOTOCHEMICAL SMOG (REPORT 6) - PHOTOCHEMICAL FORMATION OF METHYL NITRATE. *(Kokagaku smoggu genin no chosa kenkyu dai-roppo shosan mechiru no kokagaku seisei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):558, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 281.)*

Exhaust gas from a vehicle running at various speeds (0 to 100 km/hr) was collected in a 1 l pyrex flask and irradiated with ultraviolet radiation. The resulting gases were analyzed with gas chromatography and mass spectrometry. At speeds higher than 60 km/hr where nitrogen oxides were found increasing significantly, the photochemical reactivities of unsaturated hydrocarbons and aromatic hydrocarbon such as toluene and xylene increased remarkably. Acetone, acrolein, methyl ethyl ketone, methyl nitrate, ethyl nitrate, nitromethane, and nitroethane were formed from the reaction. Of them, methyl nitrate was formed at a high concentration. Approximately 1.6 ppm of CH3NO3 was formed when exhaust gas from the vehicle running at 60 km/hr was diluted 10 times and irradiated for 30 min. It was concluded that the necessary condition for CH3NO3 formation was higher NOx concentration in exhaust gas.

39770 **APTIC NO. 62260**

Lindberg, James D. and Larry S. Laude

A MEASUREMENT OF THE ABSORPTION COEFFICIENT OF ATMOSPHERIC DUST. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., DA Task IT061102B53A-19, Rept. ECOM- 5525, OSD-1366, 24p., Dec. 1973. 15 refs.*

NTIS, DDC: AD-772701

A method developed by previous workers for measuring the absorption coefficient of strongly absorbing powdered materials has been applied to samples of atmospheric dust in the 0.3 to 1.1 micron wavelength interval. The work is based on the Kubelka-Munk theory of diffuse reflectance and provides an estimate of the optical absorption coefficient. The corresponding imaginary refractive index is calculated from this value. Results are given for several samples of dry atmospheric dust collected in the desert of southern New Mexico. The diffuse reflectance measurements were made by spectrophotometry. A typical value for the imaginary refractive index was found to be 0.007 at 0.6 micron with little dependence on wavelength in the spectral range investigated. These results are in good agreement with those of other workers obtained by different methods. (Author abstract modified)

39771 **APTIC NO. 62600**

Lowes, T. M., M. P. Heap, S. Michelfelder, and B. R. Pai

MATHEMATICAL MODELLING OF COMBUSTION CHAMBER PERFORMANCE. *J. Inst. Fuel, vol. 64:343-351, Dec. 1973. 33 refs.*

The principal models for the prediction of heat flux and temperature distribution in a combustion chamber are critically reviewed. The problems associated with their extension to the prediction of nitrogen oxides are discussed. A trial series (M-2) and aerodynamic investigation are outlined. It is not possible at present to predict heat flux from fundamental considerations because of the lack of physical and chemical information. Information is required on: turbulent exchange coefficients in combusting flows; kinetic expressions controlling the formation of soot and flame generated products; and attenuation coefficient for soot radiation relating to particle properties. Nitrogen oxides emissions from turbulent flames cannot be predicted without a model to accommodate time varying phenomena. The most promising short-term approach to the prediction of 3-D combustion chamber performance is by the combination of physical modeling and a radiation exchange matrix, but in the long term the Spalding model in a refined 3-D form will possibly be superior. All the theoretical approaches require substantial experimental information. The M-2 trials have gone a considerable way towards providing this information; however, further experimental work is required in strongly convective and high thermally loaded systems. (Author conclusions modified)

39772 **APTIC NO. 62189**

Ludwig, C. B., W. Malkmus, J. E. Reardon, and J. A. L. Thomsen

HANDBOOK OF INFRARED RADIATION FROM COMBUSTION GASES. *National Aeronautics and Space Administration, Washington, D. C., Marshall Space Flight Center, 497p., 1973. 215 refs.*

NTIS: NASA SP-3080

Data is presented on radiative transfer in masses of combustion gases and flames. Radiant emission and absorption by combustion gases is reviewed. Typical applications include rocket combustion chambers and exhausts, turbojet engines and exhausts, and industrial furnaces. Some mention is made of radiant heat transfer problems in planetary atmospheres, in stellar atmospheres, and in reentry plasmas. Particular consideration is given to the temperature range from 500 to 3000 K and to the pressure range from 0.001 to 30 atmospheres. Strong emphasis is given to the combustion products of hydrocarbon fuels with oxygen, specifically to carbon dioxide, water vapor, and carbon monoxide. Species such as hydrogen fluoride, hydrogen chloride, cyanide, hydroxide, and nitric oxide are also discussed. A qualitative discussion is given of molecular radiators, molecular spectra, and radiative heat transfer in nongrey gases. The procedure for evaluating heat transfer from a given flow system is outlined, and guidelines for practical application of the handbook are given. Detailed discussions are presented on the properties of gaseous radiators and theoretical models for spectral emission from homogeneous and nonhomogeneous gases. Properties of the most commonly occurring molecules are tabulated, and specific computational models for these molecules are discussed. Emission from particle clouds and scattering effects in such clouds are discussed. (Author introduction modified)

39773 **APTIC NO. 61845**

Matsuno, Takeo

POLLUTION OF ENVIRONMENT BY MERCURY. RATE OF ESCAPE INTO ATMOSPHERE. *(Suigin no kankyo osen. Taiki e no sokudo). Text in Japanese. Denki Kagaku Oyobi Kogyo Butsuri Kagaku (Electrochem. Ind. Phys. Chem.), 41(5):314-318, May 1973. 28 refs.*

The rate of mercury escape into the atmosphere from the top of a salt-electrolysis tank was calculated using the equation N equals c1/(h/D1)-(1/kf H)), where c1 is the solubility of Hg in 0.1 N sodium hydroxide solution, D1 the diffusion constant of Hg in 0.1 N NaOH solution, h the depth of the scrubbing water, kf the transfer coefficient of Hg in air, and H is Henry s constant. The rate of escape was calculated for a rate determining step of convection, as well as diffusion.

39774 **APTIC NO. 61929**

Ogasawara, Mitsunobu, Toshimi Takagi, Masaaki Matsuhama, and Kenichi Fujii

BASIC STUDIES ON FORMATIONS OF NITROGEN MONOXIDE AND CARBON MONOXIDE IN COMBUSTION GAS AND THEIR REDUCTION METHODS (1ST REPORT, THE STUDY MADE THEREOF BY THE MEASUREMENTS IN THE REAR FLAME CURRENT AND BY THE REACTION VELOCITY THEOREM). *(Nenshogasu-chu no NO oyobi CO no seisei to sono teigenho ni kansuru kisoteki kenkyu, (Dai 1-ppo, Kasai koryu ni okeru sokutei to hanno sokudoron ni yoru kento)). Text in Japanese. Nippon Kikaigakki Ronbunshu (Trans. Japan. Soc. Mech. Engrs.), 39(327):3417-3426, Nov. 1973. 32 refs.*

A normal flat flame produced by combustion of a propane-air premixture was examined to see whether the Zeldovich mechanism for nitric oxide formation was sufficient to explain the effects of temperature and equivalence ratio, what valve would be most appropriate for the reaction velocity constant, and how long carbon monoxide and other gases in the neighborhood of the flame can remain deviated from their equilibrium composition values (and how this would effect NO formation). With the theoretical air-fuel mixture ratio and a lean mixture the CO concentration in the neighborhood of the flame surface is much greater than expected from chemical equilibrium values but rapidly approaches the equilibrium value in the rear of the flame current. Under these conditions the NO concentration is smaller in the neighborhood of the flame surface. The NO is primarily formed in the rear of the flame current, and is greatly affected by temperature. Nonequilibrium concentration values of CO approximate the equilibrium value within three milliseconds. The speed at which it approabhes the equilibrium value appears to be governed by the reaction velocity theorem. The NO formation at the rear of the flame current can be explained by the Zeldovich mechanism for fuel under the aforementioned conditions.

39775 **APTIC NO. 62684**

Paschinger, H., J. Paschinger, and H. Gaffron

PHOTOCHEMICAL DISPROPORTIONATION OF SULFUR INTO SULFIDE AND SULFATE BY CHLOROBIUM LIMICOLA FORMA THIOSULFATOPHILUM (SUMMARY). *In: Research in Photobiology and Photochemistry (Final Report, 1964-1973). Florida State Univ., Tallahassee, Inst. of Molecular Biophysics, National Aeronautics and Space Administration Grant NGR 10-004-018, 3p., July 1973.*

NTIS: N73-27937

The photochemical disproportionation of sulfur into sulfide and sulfat by the anaerobic bacterium Chlorobium limicola forma thiosulfatophilum was investigated. Chlorobium assimilates carbon dioxide in the light with various S compounds as electron donors. In the dark the reaction is partially reversed when S is reduced to hydrogen sulfide. An H2S production from S which is light dependent was found which is more than 10 times faster than the dark reaction. The cell suspension is illuminated in the absence of CO2 and is flushed continuously with hydrogen, helium, or argon. The H2S is trapped with zinc chloride, and the S- titrated with iodine. The amount of H2S evolved in the light increases proportionally with the amount of S added, and the yield is about one half of the added S when compared on a molecular basis. Another part of the metabolized S appears at the same time as SO4, but all the S oxidized to SO4 does not account for the larger amount of S reduced to H2S.

39776 **APTIC NO. 61685**

Petrov, N. M., Malkiman, V. I., Apakhov, I. A., Gribanova, L. M., Olesova, A. L., L. N. Manaeva, L. A. Artomasova, and A. A. Zharova

INDUSTRIAL TESTS OF NEW VANADIUM CATALYST FOR OXIDATION OF SULFUR DIOXIDE. *Soc. Chem. Ind. (English translation from Russian of: Khim. Prom.), 5(11):714-716, Nov. 1973. 2 refs.*

The results of industrial tests of the SVS vanadium catalyst for the oxidation of sulfur dioxide in an industrial contact apparatus are presented. A ring-shaped catalyst produced under pilot plant conditions was used. A comparison of the reaction rate constants for oxidation of SO2 on the SVS catalyst and on the BAV granulated contact shows that at high temperatures the catalysts have about the same activity, while the low temperatures the activity of SVS is 5-7 times higher.

39777 **APTIC NO. 62682**

Rigo, H. G.

AN EXTENDED EVALUATION OF A PARTICULATE PRECIPITATING HEAT TRANSFER SURFACE (FINAL REPORT). *Construction Engineering Research Lab., Champaign, Ill., Rept. CERL-TM-E-20, 285p., Nov. 1973. 96 refs.*

NTIS, DDC: AD 770395

An extended evaluation of a particulate precipitating heat transfer surface is presented along with an analysis of particle collection. An inertial particle tracking model is coupled with the flow field solution to predict collection efficiency, and qualitative experimental confirmation of the flow field is obtained from flow visualization experiments. Experimental analysis of the fractional aerosol capture efficiency of the flow obstruction indicates that for small particles in turbulent flow, diffusion governs collection. Large particles rebound from the collector due to undissipated kinetic energy. The heat transfer effectiveness of the geometry is estimated within 6% of the experimental values using a novel coupling of the Chapman-Korst cavity flow model and the equivalent wedge similarity solution.

39778 **APTIC NO. 61643**

Yates, W. F. and J. C. Burison

CHEMICAL REACTIONS IN A SILENT ELECTRIC DISCHARGE. *Chem. Technol., 3(1):31-35, Jan. 1973. 6 refs.*

Experiments producing ozone using an electric discharge as a method of getting activation energy directly from hot electrons are described. The direct use of this electrical energy source conserves fossil organics for raw materials, and O3 is the only material in commercial production that uses this source. Further investigations were made and are discussed. The apparatus used is identical to a standard ozone generator. A layer of aluminum foil wrapped around the outer tube, and a liquid electrolyte in the inner tube form the electrodes across which is applied an electric field. Gaseous reactants are passed through the electric field in the annular space between the tubes, and products are recovered in an appropriate collection system downstream. Plans for future work call for continued effort on improving power yields, reactor design, chemical yields, and conversions for reactions of commercial interest.

1972

39779 **APTIC NO. 62825**

Brenner, Howard and Duane W. Condiff

TRANSPORT MECHANICS IN SYSTEMS OF ORIENTABLE PARTICLES. III. ARBITRARY PARTICLES. *J. Colloid Interface Sci., 41(2):228-274, Nov. 1972. 24 refs.*

A general theory of orientable particles developed in a previous pair of papers for axially symmetric particles is extended to particles of arbitrary shape. An exposition of the fundamental features of the general theory is given and includes a general derivation of conservation equations in generic form and their reduction to physical space conservation laws by orientation integration. The theory is reduced to the Brownian motion limit of dilute solute particles bathed in solvent fluid, and the general features of this case are described in depth. Included are the orientation specific rotational and translational diffusion laws and the orientation summed diffusion laws for physical space. Detailed discussions of examples are presented and include general aspects of an equilibrium distribution of orientations in the presence of conservative external forces and torques which are applied in extensive descriptions of two illustrations of orientational equilibrium.

39780 **APTIC NO. 62322**

Edwards, H. W. and G. R. Schultz

SURFACE PROPERTIES OF AUTOMOTIVE LEAD COMPOUNDS. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 82-97, 1972. 9 refs.*

NTIS: PB 223623

The surface properties of automotive lead compounds were studied to evaluate the probable importance of these properties in processes involving automotive lead in the atmosphere and to understand the chemical and physical nature of lead in the environment. The adsorption of n-hexane vapor on lead bromochloride was measured at 7.60, 17.45, and 27.65 C for both unground and ground samples of the solid. Grinding at liquid nitrogen temperature produced an approximately fivefold increase in specific surface area with a concomitant change in the energetics of the surface. Adsorption of the n-hexane on both preparations with Type II physical adsorption according to the Brunauer classification. Thus, it seems unlikely that a film of n-hexane vapor on PbBrCl would be stable under atmospheric conditions. (Author abstract modified)

39781 **APTIC NO. 62218**

Lee, S. C., P. T. Harsha, J. E. Auiler, and C. L. Lin

HEAT MASS AND MOMENTUM TRANSPORT IN FREE TURBULENT MIXING. *Heat Transfer and Fluid Mechanics Inst., Stanford, Calif., Proc. Heat Transfer Fluid Mech. Inst., Northridge, Calif., 1972, p. 215-230. 26 refs. (June 14-16.)*

Free turbulent mixing was analyzed using the conservation principles of mass, momentum, turbulence kinetic energy, species concentration, and total energy in a continuum medium. The use of the turbulence kinetic energy equation provided a unique method for treating the momentum exchange coefficient in the similarity region of various types of turbulent flow problems. The required empirical constants, which relate the turbulence kinetic energy to the diffusion, production, and dissipation processes were the same for incompressible and compressible fluids, isothermal and nonisothermal mixing, and for two-dimensional and axisymmetric flow geometries. The so-called eddy viscosity became one of the flow parameters which can be calculated from the dependent variables of velocity and turbulence energy. The governing differential equations were written in a generalized parabolic form and solved numerically by a successive marching technique along the mean-flow direction. Analytical solutions were obtained for the distributions of velocity, turbulence energy, species concentration, and total enthalpy in the free mixing region; and comparison with published experimental data was made for heated coaxial hydrogen air jets. Good agreement was obtained for all investigated flow parameters in both longitudinal and radial directions. The balance of turbulence kinetic energy was analyzed by considering the contribution of each individual process of convection, diffusion, production, and dissipation; and the validity of the equilibrium turbulence assumption was evaluated by comparing the relative magnitude of the production and dissipation terms, as well as the convection and diffusion terms in the mixing region. (Author abstract modified)

39782 **APTIC NO. 62190**

Madelaine, G. I., I. Pradel, D. Vigla, and N. Dupoux-Clerc

THE PHOTOCHEMICAL PROCESS OF SO2 OXIDATION -- FORMATION OF SUBMICROSCOPIC ACID HAZES. *(Proces fotochemiczny utleniania SO2 i powstawanie submikronowych mgiel kwasnych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(3):42-47, 1972.*

NTIS: TT 72-54023/3

The formation of ultramicroscopic aerosols by the action of solar radiation on gaseous contaminants in atmospheric air is reviewed. Sulfur dioxide is the source of sulfuric acid aerosols. In the liquid phase, SO2 dissolves in droplets of water and in the presence of some catalysts (metal salts), oxidation takes place to form the sulfuric acid aerosol. In the gaseous phase, H2SO4 forms during photochemical oxidation of SO2. The role played by SO2 in the formation of particles due to photolysis was studied in several experiments. Other laboratory experiments were conducted to show the necessity of having other gaseous contaminants present in the reaction. The reaction mechanism is discussed. Field experiments showed that particle concentrations increased after sunrise agreeing with the hypothesis that aerosol changes were due to photolysis. The concentration of particles decreased after sunset, agreeing with the hypothesis that the changes were due to photolysis. However, correlations could not be established with certainty, and the changes in concentration might be due to changes in the degree of the dustiness of the atmosphere. Measurement of the visible ray of the aerosol showed that rising concentrations of aerosols corresponded to reduced rays, and vice versa. This could only be accounted for by the formation of a very large number of particles due to photolysis.

39783 **APTIC NO. 62057**

Wojciechowski, J.

INVESTIGATIONS OF PHYSICO-CHEMICAL PROCESSES IN THE ATMOSPHERE OF URBAN AND INDUSTRIAL CENTERS. *(Badania fizyko-chemicznych procesow zachodzacych w atmosferze osrodkow miejskich i przemyslowych). Air Conserv. (English traaslation from Polish of: Ochrona Powietrza), 6(1):18-26, 1972. 11 refs.*

An explanation is given of the reactions of photochemical oxidation of sulfur dioxide and of some organic compounds in the presence of nitrogen dioxide. The mechanisms of the build up of smog with an acid reaction and of oxidizing smog in the atmosphere of large urban and industrial centers are presented. Photochemical oxidation of sulfur dioxide causes the formation of slight amounts of ozone and sulfuric acid aerosol. Oxidizing smog is due to nitrogen oxides and O3 in the atmosphere which react with hydrocarbons to form peroxyacetyl nitrate, ketones, aldehydes, acrolein, formaldehyde, and other toxic properties. The reaction mechanisms of this photolysis and photooxidation reactions are described.

1971

39784 **APTIC NO. 62225**

Kassner, J. L., Jr., P. L. M. Plummer, B. N. Hale, and A. H. Biermann

THE ROLE OF EXPERIMENT IN THE DEVELOPMENT OF A MOLECULAR THEORY OF NUCLEATION OF WATER VAPOR-THE EFFECTS OF CLUSTER STRUCTURE AND INCLUSION OF IMPURITY MOLECULES. *Australian Academy of Science and American Meteorological Society, Boston, Mass., Int. Conf. Weather Modification, Proc., Canberra, Australia, 1971, p. 51-56. 19 refs. (Sept. 6-11.)*

Nucleation rates have been studied as functions of increasing peak supersaturation, temperature, and time. Some of the experimental observations are reviewed. The classical liquid drop theory is not well suited to take into account the inclusion of a few impurity molecules into the clusters. Therefore a statistical mechanical molecular theory was developed for the nucleation of water vapor alone. The model views the vapor state as composed of clusters of water molecules joined together by hydrogen bonds in specific geometrical structures. The clusters grow and disperse upon collision with carrier gas and vapor molecules. Internal motions may cause the spontaneous emission of molecules from the cluster; however the lifetime of a cluster is assumed to be sufficiently long that its internal vibrational spectrum can be characterized. Statistical mechanics is applied to individual cluster structures and cluster models are constructed which maintain nearly tetrahedral angles between hydrogen bonds, maximize the number of bonds, and require the highest degree of spherical symmetry for the cluster as a whole. Pauling s clathrate-like structure appears to present a favorable model for clustering and allows greater binding energy and more symmetry than an ice-like structure. Other structures are also being considered. The nucleation of water droplets and ice in clouds is important in weather modification.

1970

39785 **APTIC NO. 62846**

Christian, W. J. and T. E. Waterman

FIRE BEHAVIOR OF INTERIOR FINISH MATERIALS. *Fire Technol., vol. 6:165-178, 188, 1970. (Presented at the National Fire Protection Association, 74th, Annual Meeting, Toronto, Canada, May 20, 1970).*

The burning of seven different interior finish materials was tested under different conditions. Material location and magnitude of fire exposure have a pronounced effect on material behavior. In general, the materials have the same relative hazard position in each test, although the Tunnel Test flame spread number does not quite place them in what appears to be the proper order. Tunnel Test flame spread number in combination with some other material property might be used to place materials in a proper relative hazard order. The data on smoke production indicate that no single smoke rating number can adequately define the relative smoke hazards of interior finish material. Both environment and other material properties completely overshadow whatever inherent smoke producing quality each material exhibits.

39786 **APTIC NO. 62194**

Wilson, K. W. and G. J. Doyle

INVESTIGATION OF PHOTOCHEMICAL REACTIVITIES OF ORGANIC SOLVENTS. (FINAL REPORT). *Stanford Research Inst., Irvine, Calif., Dept. of Health, Education, and Welfare Contract CPA 22-69-125, SRI Proj. PSU-8029, 81p., Sept. 1970. 23 refs.*

NTIS: PB 215 659

The photochemical reactivities of 20 commercial solvents were measured by experiments using a smog chamber. Each solvent was studied in a simple system comprising pure air, nitrogen dioxide, and the individual test solvent (Group I experiments) and in a more complex mixture comprising pure air, propylene, toluene, butane, and $NO2$ (Group II experiments), and the test solvent. Reactivities were evaluated by measuring dosages of $NO2$, oxidant, ozone, and peroxyacetyl nitrate, rates of disappearance of $NO2$, test solvent, propylene, toluene, and butane, eye irritation level, and maximum aerosol level. The most important implication of this treatment of the experimental data is that reactivity of saturated compounds in a matrix simulating an atmosphere polluted with auto exhaust is governed more by the types and numbers of carbon hydrogen bonds in the molecule than by the presence or absence of oxygenated functional groups. Photochemical reactivities of saturated compounds in a reacting background mixture might be predicted on the basis of a relatively simple model. The determination of the rates of reaction of hydroxyl with $H2$ atoms in a carefully selected series of compounds could provide information of great value in determining whether hydroxyl is the important reactive intermediate. (Author summary modified)

EFFECTS-HUMAN HEALTH

1974

39787 **APTIC NO. 62449**

Albert, R. E., R. E. Shore, A. J. Sayers, C. Strehlow, T. J. Kneip, B. S. Pasternack, A. J. Friedhoff, F. Covan, and J. A. Cimino

FOLLOW-UP OF CHILDREN OVEREXPOSED TO LEAD. *Environ. Health Perspect., no. 7:33-39, May 1974. 15 refs.*

The nature and magnitude of the deleterious health effects of subclinical over-exposure to lead in children was assessed. The study stems from concerns about the impact on the health of children in city slums who ingest leaded paint without overt evidence of poisoning and the health of implication of rising levels of lead in the environment from automotive emissions. The study sample was derived mainly from a registry of children on whom blood lead determinations had been made by the New York City Department of Health and was supplemented by siblings of the registry cases and children from a lead belt area who had extractions of deciduous teeth in dental clinics. Information was obtained through parental interview, medical records, and psychometric evaluation. Deleterious health effects occur in children who were treated for severe lead poisoning and in children without diagnosed lead poisoning who had elevated blood leads (greater than or equal to 0.06 mg-%). In the absence of diagnosed lead poisoning or elevated blood leads, excess lead exposure, measured in terms of high levels of lead in teeth, was not associated with deleterious health effects. (Author abstract)

39788 **APTIC NO. 62447**

Alexander, F. W.

THE UPTAKE OF LEAD BY CHILDREN IN DIFFERING ENVIRONMENTS. *Environ. Health Perspect., no. 7:155-159, May 1974. 15 refs.*

Balance studies have been performed for lead upon eight healthy children in three different home environments and upon eight children with inborn errors of metabolism in hospital (consuming two different types of synthetic diet). The balances were for 3 days and involved the use of metal-free diapers where indicated. The concentration of lead in all the samples was determined by atomic absorption spectroscopy after suitable sample preparation. In addition, the total population of children under the age of 16 living in a working class area exposed to undue amounts of lead was examined in an attempt to determine whether their mental development had been affected. Blood lead levels, generaly intelligence, reading ability, and rate of behavior disorder were measured. The mean daily intake of lead in both groups of children was lower than previously recorded figures, being lowest of all in the breast-fed infant. The healthy groupd absorbed a mean value of 53% and retained 18% of the dietary intake and there was no relationship to age or month of the year of the study. The children with inborn errors showed a significantly lower percentage absorption of lead (24%). The preliminary results of the population survey showed that distance from the polluting lead source was related to blood lead level, but no relationship could be found between blood lead level and any measure of mental function. (Author abstract)

39789 **APTIC NO. 62361**

Angle, Carol R. and Matilda S. McIntire

RED CELL LEAD, WHOLE BLOOD LEAD, AND RED CELL ENZYMES. *Environ. Health Perspect., no. 7:133-137, May 1974. 22 refs.*

Simultaneous assay of blood lead (Pb-B) and red cell lead (Pb-Rbc) in 123 samples from 104 urban and suburban students, ages 10-18, shows the ratio of concentration (Pb-Rbc): (Pb-B) to increase as the hematocrit decreases. On direct assay in 40 samples, plasma lead (Pb-P) was fixed in a narrow range. In 28 students with Pb-Rbc greater than 40 micrograms/100 ml, the mean red cell 2,3-diphosphoglycerate (2,3-DPG) was 6.05 + or - 0.28 (+ or - SE), significantly higher (P less than .025) than the 5.25 + or - 0.18 of 51 students with Pb-Rbc less than 40 micrograms/100 ml, although hemoglobin values were comparable (13.83 + or - 0.31 versus 13.55 + or - 0.20). Analysis of the individual population groups showed this correlation of Pb-Rbc with 2,3-DPG to be primarily related to the intercorrelation of each parameter with hemoglobin. The Rbc membrane sodium/potassium ATPase, as % of total membrane ATPase, had a median value of 60% in 48 subjects. Sodium/potassium ATPase below 60% was found in 10 (77%) of the 13 students with Pb-Rbc greater than or equal to 40 micrograms/100 ml, but in only 14 of the 35 with Pb-Rbc less than 40 micrograms/100 ml (Chi-square equals, 5.1, df equals 1, P is less than 0.05). Correlation of significant enzyme changes with Pb-Rbc, but not with Pb-B in the normal urban range of Pb-B less than 35 micrograms/100 ml suggests Pb-Rbc, increased in anemia, to be a critical factor in the hematotoxicity of lead. (Author abstract)

39790 **APTIC NO. 61822**

Antopol, William, Leonard Newman, Robert Doering, Chryssanthos Chryssanthou, and Eugene Cronkite

LEAD EXPOSURE: FOCAL CONCENTRATIONS FROM ATMOSPHERIC FALLOUT. *Mount Sinai J. Med., 41(1):250-253, Jan.-Feb. 1974. 9 refs.*

A study of atmospheric lead fallout which accumulates over prolonged periods on structures, such as window sills, which are directly exposed to thoroughfares and roadways is discussed. Localized reservoirs containing Pb compounds can form at specific sites in concentrations and in absolute amounts which at times exceed even the highest atmospheric Pb aerosol level by a factor of 100 or more. High concentrates of inhaled Pb from these reservoirs can gain direct access to the blood and tissues. The Pb content of outer sill dust was assayed at various floor levels of single buildings as well as buildings on both sides of an entire street. High concentrations of Pb with wide variations were found at different floors even in the same street. Preliminary findings indicate the greatest Pb fallout is present on the sills of the buildings at the center of the block and less on those near the street intersections. The observation that the brain lesions are more frequent in preschool children and occur most often from late spring into early autumn may have significance in that this corresponds to the period when the windows are open.

39791 **APTIC NO. 62596**

Balazova, G. and V. Lipkova

EVALUATION OF SOME HEALTH PARAMETERS IN CHILDREN IN THE VICINITY OF AN ALUMINUM FACTORY. *Fluoride, 7(2):88-93, April 1974. 4 refs.*

The health status of 6-14-year old children was investigated with special regard to the hematological indices and the content of fluorine compounds in urine and hair. The children have been living in a settlement in the environs of the aluminum factory in operation for 20 yr. In the first years of the operation of the factory, examinations of children showed evidence of potential hazard, induced by the influence of the factory on the environment. Certain sanitary measures were designed and implemented: a portion of the population was translocated; precautions were taken regarding consumption of crops grown in the polluted area; and regular visits to clinically suitable recreational areas were organized every year for children. After 10 yr the medical examinations were repeated. The values obtained were related to the concentration of fluorine compounds in the air and compared with the results obtained from a group of children of the same age during the first years of the operation of the factory. There was a clear and total improvement of the studied indices. Their values approach the values of the control group of children from nonexposed areas. (Author summary modified)

39792 **APTIC NO. 62448**

Barltrop, D., C. D. Strehlow, I. Thorton, and J. S. Webb

SIGNIFICANCE OF HIGH SOIL LEAD CONCENTRATIONS FOR CHILDHOOD LEAD BURDENS. *Environ. Health Perspect., no. 7:75-82, May 1974. 15 refs.*

The lead exposure of children and their mothers has been studied in two towns with mean soil lead contents of 900 and 400 ppm. Lead in soils normally results from natural geological sources, industrial, mining, and smelting activity, as well as from lead additives in gasoline. In these two cases airborne lead was not contributing significantly to lead exposure. No significant difference in blood or fecal lead contents was demonstrated between the two populations, but a small difference in hair lead content was shown. The blood lead content of children was greater than that of their mothers and was higher in the summer than in the spring samples. Children with pica for soil in the control area had increased lead content of blood and hair. Preliminary data for children and mothers from villages with mean soil lead contents of 500 ppm and 10,000 ppm are reported which show significant differences in blood and hair lead content within the normal range. The data suggest that soild lead content of 10,000 ppm may result in increased absorption of lead in children, but to a degree which is unlikely to be of biological significance. (Author abstract modified)

39793 **APTIC NO. 62796**

Benarie, M.

STOCHASTIC DEFINITION OF THE NOTION PERMISSIBLE LIMIT. *(Presentation probabilistique de la notion - Limite admissible-). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 10-1-10-15. 8 refs. (May 8-10.)*

A toxicological approach to the definition of admissible limits for air pollutants is proposed. Observations on the frequency of the effects of air pollution as a function of different doses or concentrations permit frequency-concentration or frequency- exposure time diagrams to be obtained. After transformation of these diagrams into concentration-exposure time diagrams, curves representing the effect in question (morbidity, mortality, physiological changes) and its frequency of occurrence are obtained. These curves show that a certain effect will occur at a certain (low) frequency. This method, having the advantage of offering a safety margin and being objective, is proposed as a methodological approach in the future organization of the experiments for the determination of admissible limits.

39794 **APTIC NO. 62008**

Berman, Ezra (ed.)

BIBLIOGRAPHY OF THE CAT. (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Toxicology Branch, Rept. EPA-650/3-74-001, Program Element IH1095, 380p., Feb. 1974.*

NTIS: PB 229869/AS

A bibliography of the cat in its role as a laboratory animal is presented which contains almost 1500 citations, the majority of which are annotated. The bibliography contains a subject index of such terms as chemicals; lungs; respiratory; trachea, larynx, and bronchi; among many other subject headings for each of which accession numbers are listed which correspond to bibliographic entries. The user need only to look up the particular characteristics which are of interest, compare the accession numbers under that heading with those under other headings of interest, and find those common numbers of the bibliography (arranged in ascending order of accession number).

39795 **APTIC NO. 62161**

Carpenter, Stanley J.

PLACENTAL PERMEABILITY OF LEAD. *Environ. Health Perspect., no. 7:129-131, May 1974. 19 refs.*

The detection of lead in fetal tissues by chemical analysis has long been accepted as prima facie evidence for the permeability of the placenta to this nonessential trace metal. However, only a few investigations, all on lower mammalian species, have contributed any direct experimental data bearing on this physiological process. Recent radioactive tracer and radioautographic studies on rodents have shown that lead crosses the placental membranes rapidly and in significant amounts even at relatively low maternal blood levels. While it is not possible to extrapolate directly the results of these experiments to humans because of differences in placental structure and other factors, the results do serve as a warning of the possible hazard to the human embryo and fetus of even low levels of lead in the maternal system. (Author abstract)

39796 **APTIC NO. 61782**

Clarke, Ann N. and David J. Wilson

PREPARATION OF HAIR FOR LEAD ANALYSIS. *Arch. Environ. Health, 28(5):292-296, May 1974. 19 refs.*

A comparison was made of washing procedures for hair samples for lead analyses. An ethylenediaminetetraacetic acid (EDTA) washing procedure proved to be the best to eliminate the surface lead contamination of hair; neither the detergent nor the hot ether washing procedures performed as well. Absorption of surface-bound lead into the hair shaft was not observed. (Author abstract)

39797 **APTIC NO. 61874**

Endo, R., S. Nagaoka, and M. Umeda

EFFECTS OF AIR POLLUTION ON THE LUNG OF BIRDS, PART II: A STUDY OF EXPERIMENTAL PATHOLOGY OF JAPANESE QUAIL. *(Taiki osen no chohai ni oyobosu eikyo (dai 2 ho) uzura hai no jikken byorigakuteki kenkyu). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept Tokyo Met. Res. Inst. Environ. Prot, vol. 5:201-202, March 1974.*

Carbon powder and the carcinogenic polynuclear hydrocarbon methylcholanthrene were singly and in combination injected into the lungs of quail at 3 mg/bird and 3 mg/100 mg in 0.2 ml of physiological saline. A control group of quail were injected with 50 mg barium sulfate to show retention and distribution. Birds from each injection group were sacrificed immediately after injection, and 1 day, 3 days, 7 days, 20 days, and 45 days thereafter. Samples were taken from the trachea, bronchi, and both lungs. No changes were seen immediately after injection in all cases. Inflammation was seen in the group exposed to carbon and the carbon-methylcholanthrene combination sacrificed after 3 days. Epithelial proliferation appeared after 3 days and continued through 45 days in the group injected with carbon and the carbon carbon-methylcholanthrene combination. The existence of carbon powder increased the topical retention of methylcholanthrene in the lung and increased carcinogenicity. Quail can be used a reliable pollution index organism.

39798 **APTIC NO. 62106**

Horiuchi, H.

EFFECTS OF AIR POLLUTION ON THE HEALTH STATE OF CHILDREN IN PRIMARY AND MIDDLE SCHOOL: INVESTIGATION OF THEIR SUBJECTIVE SYMPTOMS FROM THEIR PUBLIC NUISANCE DIARIES. *(Taiki osen ga jido seito no kenko ni oyobosu eikyo - kogai nisshi ni yoru jido seito no jikaku shojo chosa). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(4):247-257, April 1974. 31 refs.*

Schoolchildren in a moderately air polluted area, a highly polluted area, and a nonpolluted area were polled by questionnaire as to general subjective symptoms and subjective respiratory symptoms during October and January in 1971. The concentration of sulfur dioxide was highest in the most polluted area, lower in the moderate area, and about half the concentration of the highest area in the relatively nonpolluted area. The per mill morbidity of all symptoms was highest in the most polluted area, and the 99th percentile value decreased in the order of decreasing pollution. Frequency of complaints of nasal congestion correlated with high percentages of SO_2 and dust in the air. Smoking by a member of the child s family did not affect subjective respiratory symptoms. Children coming from a bad home environment showed a higher incidence of respiratory disease, suggesting that environmental conditions other than air pollution strongly affect the health history of children.

39799 **APTIC NO. 62160**

Howard, Peter

THE CHANGING FACE OF CHRONIC BRONCHITIS WITH AIRWAYS OBSTRUCTION. *Brit. Med. J. (London), 2(5910):89-93, 1974. 33 refs.*

A total of 178 patients with obstructive airways disease were studied between 1966 and 1972, a period which followed a substantial fall in atmospheric pollution in Sheffield. Compared with patients from an earlier study of the same age and smoking habits they had less productive cough, fewer winter illnesses, less severe breathlessness, and only 1/3 of the rate of decline of forced expiratory volume (FEV). The analysis of the change in the annual loss of FEV was complicated. There were virtually no sudden steep falls of respiratory function, and patients with very low values of FEV survived for long periods. The predominant cause of death was cor pulmonae. Chronic hypoxia may be more of a problem in the next few years than bronchial infection. Apparently the clean air policy has effected an improvement and the nature of chronic bronchitis with severe obstructive airways disease is changing, but further studies will be needed to confirm this. (Author abstract)

39800 **APTIC NO. 62877**

Hysell, David K., Wellington Moore, Jr., Jerry F. Stara, Robert Miller, and Kirby I. Campbell

ORAL TOXICITY OF METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL (MMT) IN RATS. *Environ. Res., 7(2):158-168, April 1974. 3 refs.*

Rats were given a single oral dose of methylcyclopentadienyl manganese tricarbonyl (MMT) diluted in Wesson Oil. Eight groups of animals were used, and the dosages varied from 15 to 150 mg/kg body weight. Necropsies were performed and tissues were taken for histopathological and manganese determinations from animals dying during the study and from a selected number of animals euthanatized at the end of the study. The LD50/14 was 58 mg MMT/kg body weight. Histopathological changes were found in the lungs, liver, and kidney. The severity of the changes related to the dose. Concentrations of Mn in selected tissues were elevated in animals dying from exposure. At 14 days post ingestion, the Mn concentrations had fallen to approximately normal values. The toxicology of MMT is of considerable interest because of possible widespread use of this agent as an antiknock compound in unleaded gasoline. This compound is also marketed as a combustion improver for fuel oils and as a smoke depressant for diesel engines and stationary jet fuel power sources. (Author abstract modified)

39801 **APTIC NO. 62290**

Johnson, D. E., J. B. Tillery, J. M. Hosenfeld, and J. W. Register

DEVELOPMENT OF ANALYTIC TECHNIQUES TO MEASURE HUMAN EXPOSURE TO FUEL ADDITIVES (FINAL REPORT). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0595, Proj. 26AAE, SwRI Proj. 01-3451-001, Program Element 1AA002, EPA-650/1-74-003, 164p., March 1974. 13 refs.*

NTIS: PB 232124/AS

Analytical and sampling methodology for measuring the amount of exposure and health effects of fuel additives to urban and rural populations were investigated. Both human exposure to normal levels of fuel additives present in urban traffic and to the high concentration under occupational conditions such as attendants in garages and parking lots and to policemen working in heavily- trafficked areas were measured. Fuel additives studied included the heavy metals, lead, manganese, copper, and zinc. Also measured in human tissue samples was the fuel impurity, cadmium. Trace metals in hair were determined to reflect long-term exposure. Blood and urine samples reflected short-term exposure. Feces measurement for Pb and Cd provided an estimation of dietary contributions. (Author abstract modified)

39802 **APTIC NO. 62176**

Kashiwagi, H., T. Takahashi, K. Soejima, Y. Karimata, M. Yanagida, and K. Miyaji

YOKKAICHI ASTHMA SEEN FROM THE AUTOPSY CASES. *(Boken-rein kara mita Yokkaichi zensoku). Text in Japanese. Preprint, Japan Society for Chest Diseases, 9p., April 1974. (Presented at the Japan Society for Chest Diseases, Annual Meeting, 14th, Tokyo, Japan, April 2-3, 1974.)*

Pathological findings and previous electrocardiogram data on cases of obstructive lung disease in Yokkaichi were examined to discover the causes of death. One group, which reported symptoms beginning before the pollution level became high, showed evidence of chronic bronchitis, bronchiolitis, bronchiectasis, and pulmonary emphysema. The group reporting symptom onset after pollution reached a high level showed different diseases, often accompanied by chronic bronchitis. There were a few cases of sudden death by asthmatic attack.

39803 **APTIC NO. 61781**

Lentz, Patrick E. and Nicholas R. Di Luzio

PEROXIDATION OF LIPIDS IN ALVEOLAR MACROPHAGES. PRODUCTION BY AQUEOUS EXTRACTS OF CIGARETTE SMOKE. *Arch. Environ. Health, 28(5):279-282, May 1974. 24 refs.*

The peroxidation of lipids in alveolar macrophages, membrane, supernatant fractions of alveolar macrophages, and pulmonary protective factor by aqueous extracts of cigarette smoke was studied in the alveolar macrophages of white male rabbits. The cigarette smoke contained free radicals of varying half lives as well as highly active oxides of nitrogen such as nitric oxide and nitrogen dioxide. Both substances can induce peroxidation of unsaturated lipids in the membranes of alveolar macrophages as well as other types of cells in the lungs. Incubation of the rabbit macrophage sonicates with aqueous extracts of cigarette smoke resulted in approximately a twofold increase in peroxidation of lipids in whole cell sonicates, supernatant, or nuclear fractions of the alveolar macrophages as measured by the thiobarbituric acid reaction (TBA). The accumulation of malonaldehyde was not reduced by supplementing the incubation media with cysteine. These studies suggest that oxidants or free radicals in the cigarette smoke induce peroxidation of unsaturated lipids in alveolar macrophages and in an acellular material that coats the cells in the lung. (Author abstract modified)

39804 **APTIC NO. 62162**

Lentz, Patrick E. and Nicholas DiLuzio

TRANSPORT OF ALPHA-AMINOISOBUTYRIC ACID BY ALVEOLAR MACROPHAGES INCUBATED WITH CIGARETTE SMOKE AND NICOTINE. *Arch. Environ. Health, 28(6):333-335, June 1974. 22 refs.*

Aqueous extracts of cigarette smoke or nicotine at concentrations that did not greatly affect cellular viability, as measured by dye exclusion, markedly reduced the transport of alpha-aminoisobutyric acid (AIB) by rabbit alveolar macrophages. Smoke extract was prepared by drawing smoke from three cigarettes (100 mm, nonfilter) into 25 ml of a modified Hanks solution. Aqueous extracts of smoke and nicotine produced a biphasic effect on AIB transport: a stimulation at low concentration, and inhibition at higher concentrations. Cell viability, as estimated by dye exclusion, was reduced only 17% by the highest concentration of the smoke extract. These data suggest that transport of a nonmetabolizable amino acid, C14-AIB, is a sensitive and quantitative assay from examining the influence of air contaminants on membrane permeability. (Author abstract)

39805 **APTIC NO. 62446**

Lepow, Martha L., Leonard Bruckman, Robert A. Rubino, Steven Markowitz, Marybeth Gillette, and Janet Kapish

ROLE OF AIRBORNE LEAD IN INCREASE BODY BURDEN OF LEAD IN HARTFORD CHILDREN. *Environ. Health Perspect., no. 7:99-102, May 1974. 10 refs.*

The ingestion of airborne lead fallout is the mechanism responsible for increased body burdens found in 10 urban Connecticut children. The mean indoor lead levels found in housedust was 11,000 micrograms/g; highest concentrations occurred on windowsills and in floor dust. The mean lead content of Hartford street dirt was 1200 micrograms/g; levels were highest near the street and next to the buildings. The mean lead concentration of hand samples taken from the subject children was 2400 micrograms/g; the mean weight of hand samples was 11 mg. The concentration of lead in dirt and household dust was high enough to theoretically result in excessive lead accumulation in young children who are putting their dusty, dirty hands in their mouths during play. While lead emitted from automobiles contributes significantly to air, dirt, and dust lead levels, the environmental impact of reducing or eliminating lead from gasoline is not yet completely understood. (Author abstract)

39806 **APTIC NO. 62067**

Menck, Herman R., John T. Casagrande, and Brian E. Henderson

INDUSTRIAL AIR POLLUTION: POSSIBLE EFFECT ON LUNG CANCER. *Science, 138(4121):210-212, Jan. 18, 1974. 16 refs.*

The effect of air pollution on lung cancer mortality was studied using mortality data from Los Angeles County. Higher lung cancer mortality rates occurred in males living in certain heavily industrialized areas of the county. These areas were characterized by elevated concentrations of benzo(a)pyrene and other polynuclear aromatic hydrocarbons of primarily industrial origin in the soil and air. The possibility that smoking or industrial exposure could have caused the excess lung cancer deaths was unlikely, although the synergistic action between smoking and neighborhood air pollution was possible. (Author abstract modified)

39807 **APTIC NO. 62876**

Milham, Samuel, Jr. and Terrence Strong

HUMAN ARSENIC EXPOSURE IN RELATION TO A COPPER SMELTER. *Environ. Res., 7(2):176-182, April 1974. 6 refs.*

Children living near a copper smelter in Tacoma, Washington had increased levels of arsenic in hair and urine. The urinary arsenic level decreased with distance of the residence from the smelter stack. House vacuum cleaner dust showed a similar distance relationship. Urine arsenic levels in children varied synchronously over a 5-week period, indicating that inhalation was the most likely exposure route. In children, the urinary arsenic level showed an inverse relationship to age, with younger children showing consistently higher urine arsenic levels. A death record analysis indicated an increased respiratory cancer incidence in men working at this smelter. Since published urinary arsenic levels for men working at the smelter were similar to those seen in people residing near the smelter, it was felt that the community surrounding the smelter might be exposed to an increased respiratory cancer risk. Therefore, action was taken to reduce arsenic emissions from the smelter. (Author abstract)

39808 **APTIC NO. 62050**

Moran, John B.

ASSURING PUBLIC HEALTH PROTECTION AS A RESULT OF THE MOBILE SOURCE EMISSIONS CONTROL PROGRAM. *Preprint, Society of Automotive Engineers, New York, 35p., 1974. 12 refs. (Presented at the Society of Automotive Engineers Congress and Exposition, Detroit, Mich., Feb. 25-March 1, 1974.)*

The Environmental Protection Agency's program to control mobile source emissions is outlined with respect to regulated and unregulated motor vehicle emissions and their health consequences. Carbon monoxide, hydrocarbons, and oxides of nitrogen are specifically regulated under Section 202(b) of the Clean Air Act of 1970, while fuels, fuel additives, and lubricants can be regulated under Section 211. Other emissions including gross particulates, fine particulates, sulfates, specific types of hydrocarbons, and trace elements constitute emissions which are not now regulated. Most research has focused on the effect of variations in aromatic content on nonregulated emissions since aromatics are the principal class of hydrocarbons which must be increased to achieve acceptable octane quality if lead additives are to be removed. Health issues which must be answered regarding nonregulated emissions include: a comparison of the toxicity of nonregulated emissions from new vehicles equipped with advanced control systems and using present lubricants and nonleaded gasoline versus the toxicity of nonregulated emissions from present vehicles using present lubricants along with leaded and nonleaded gasoline; the effect of alternate power systems in new vehicles on toxicity; projected adverse health effects arising from the combined emissions from newer vehicles and a population of less well-controlled vehicles; and possible adverse health effects arising from novel pollutants as a result of advanced control system and/or advanced power system malfunction.

39809 **APTIC NO. 61793**

Mudd, J. B., F. Leh, and T. T. McManus

REACTION OF OZONE WITH NICOTINAMIDE AND ITS DERIVATIVES. *Arch. Biochem. Biophys., 161(2):408-419, 1974. 28 refs.*

Characteristics of the reaction of ozone with nicotinamide (NADH) and its derivatives were investigated in in vitro studies. The results show that NADH and NADPH are readily oxidized by O3 and the products do not have a biological activity. However, NAD and NADP are relatively resistant. Other things being equal, physiological conditions which cause the preponderance of the reduced forms may be predicted to be more suspectible to O3. Results with NADPH show that the oxidation by O3 holds to a constant time times concentration relationship. The stoichiometry is the same down to concentrations of O3 found in the Los Angeles atmosphere, and NADH concentrations found in some tissues. The spectrophotometric changes on treatment of NADH with O3 indicate that adenine moiety is relatively resistant. Among the amino acids, the most susceptible are cysteine, tryptophan, and methionine, and NAHD is preferentially oxidized. Under physiological conditions in animals, the first point of attack will be in the lung tissue.

39810 **APTIC NO. 62112**

Murakami, S., S. Hosokawa, H. Kondo, Y. Fujimori, C. Sato, F. Morito, R. Yasuhara, K. Utsumi, H. Aokage, I. Fukuda, S. Ishii, Y. Mori, M. Tokunaga, T. Miyata, S. Miyazaki, K. Okada, and T. Kuriya

ON THE INVESTIGATION ON ASTHMA OF CHILDREN IN PRIMARY AND MIDDLE SCHOOLS IN FUKUYAMA CITY: PART III. *(Fukuyama shinai sho-chugakko jido seito no zensoku chosa ni tsuite(dai 3 shu)). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 27(4): 404-413, April 1974. 4 refs.*

The health of schoolchildren in Fukuyama was investigated through questionnaires, personal interviews, and detailed medical examinations. Nine schools in polluted areas provided two groups of 603,242 and 74 children, and six schools in nonpolluted areas gave 55 and 18 control children. Questionnaires showed 10.4% of the children had stridor, 57% with dyspnea accompanied by stridor, and 3.3% with orthopnea. Physicians had diagnosed 5.3% of the children as having as asthma morbidity of 3.2%. Seven percent of the stridor cases, 3.6% of the stridor plus dyspnea cases, and 1.5% of the orthopnea cases were in a controlled state. Personal interviews showed 3.4% of the children to have dyspnea, and 1.3% of these have serious symptoms such as orthopnea or cyanosis, 0.8% controlled. Medical examinations show 3.3% of the children have dyspnea with 2.2% controlled cases, and 50% have had more than three asthma attacks in the past 2 yr, 50% controlled. Asthmatic attacks occurred more frequently in autumn and winter. There was a higher morbidity of asthma in children with allergic family histories, but there was no great difference in residence histories. The total percentage of children with confirmed asthma was 1.6%. Blood sedimentation rates were moderately high in both groups. Pulmonary ventilation was almost the same in both groups.

39811 **APTIC NO. 61864**

Nagaoka, S.

STUDIES ON THE POTENTIAL EFFECTS ON HUMAN BODY OF AIR POLLUTION, ESPECIALLY ON THE RELATIONSHIP BETWEEN CHRONIC OBSTRUCTIVE DISEASES IN THE LUNG. PART I. *(Taiki osen no senzaiteki jintai eikyo - tokuni mansei heisokusei hai shikkan tono kanren - ni kansuru kenkyu (dai 1 ppo)). Text in Japanese. Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot., vol. 5:191-200, March 1974.*

Health examinations were carried out on residents of polluted and unpolluted sections of Tokyo to determine the effects of air pollution primarily on the lungs. Subjective symptoms polled by questionnaire and physical examinations including chest x-rays, pulmonary function tests, immunological tests, hematological tests, and otorhinolarynogological examinations provided the data. Morbidity of colds, abnormal blood chemistry, irritation of the respiratory system, and lowered erythrocyte delta-aminolevulinic acid dehydratase activity was higher in the polluted areas.

39812 **APTIC NO. 62180**

Nagata, I., S. Suzuki, H. Oya, T. Makihara, S. Kido, S. Ono, and F. Tajima

RESULTS OF INVESTIGATIONS ON THE EFFECTS OF DUSTS ON HUMAN BODIES IN AN INDUSTRIAL AREA OF AICHI PREFECTURE. *(Aichi-ken no kogyo chiiki ni okeru baijin osen no jintai eikyo chosa). Text in Japanese. Koshu Eisei (Public Health), 38(4):245-248, April 1974. 3 refs.*

Health examinations were carried out on 120 mon-smoking inhabitants of more than 3 years duration in Aichi Prefecture to determine the effects of lead and chromium in dusts exhausted from major factories in the area. Data was gathered from medical histories, physical examinations, lung functions tests, hematological work-ups, blood pressure readings, muscle tone, urinalysis, and chest X-rays. Sixty subjects were then examined in greater detail with lung function tests, venous blood examinations, hematocrit percentages, hemoglobin levels, lead and chromium contents of the blood and urine, delta-aminolevulinic acid, coproporphyrin, and protein in the urine. Subjects in the larger group uniformly complained of early fatigue, and 5, 9, 6, 23, and 4 persons showed anomalies of glycosuria, preterinuria, urobilinogen, coproporphyrin, and chest X-rays, respectively. The detailed examinations revealed an average lead content in male and female blood of 21.5 and 12.5 micrograms/dl, respectively, and lead in the urine was 25.0 and 24.4 micrograms/l. Seventeen, 20, 20, and 1 persons showed no symptoms, mild symptoms, moderate symptoms, and acute symptoms, resectively, and severity of anomalies increased with age. The chromium content of the blood and urine averaged 0.8 micrograms/dl and 4.5 micrograms/l. Effects of dust on lung function could not be determined. The effects of Pb, Cr, and dusts are not now seriously toxic.

39813 **APTIC NO. 62145**

Needleman, Herbert L. and Irving M. Shapiro

DENTINE LEAD LEVELS IN ASYMPTOMATIC PHILADELPHIA SCHOOL CHILDREN: SUBCLINICAL EXPOSURE IN HIGH AND LOW RISK GROUPS. *Environ. Health Perspect., no. 7:27-31, May 1974. 10 refs.*

Dentine lead levels were measured in 760 asymptomatic schoolchildren from two school districts, one considered high risk for lead exposure, and one considered low risk. Elevated levels were found in black children living in deteriorated housing and in those white children from housing in good repair who lived and attended school in proximity to a major manufacturer of paint and lead products. In addition, traffic may be a factor. In the Philadelphia lead belt, 66% of black children have elevated dentine lead levels, with 19% in the range found with clinical lead poisoning.

39814 **APTIC NO. 61747**

Nose, Yoshikatsu

ENVIRONMENT AND DISEASES. *(Kankyo to shippei). Text in Japanese. Iryo (Medical Treatment), 28(2):11-13, Feb. 1974.*

The general relation of pollution disease is discussed. Pollution is defined as changes of the structure and state of the environment caused by human actions which result in the deterioration of living conditions. The effect of pollution on human health is usually chronic and no significant changes can be found during the early stage of exposure. Symptoms in the initial stage are generally curable but can become fatal. Diseases are considered to be due to multifactorial causation and their preventions can be achieved by epidemiological studies of the hosts, agents and environments. Diseases caused by air pollution include chronic bronchitis, bronchial asthma and pulmonary emphysema. Preventions of these chronic respiratory diseases require extensive monitoring of air pollution and intensive diagnosis of pollution victims.

39815 **APTIC NO. 61853**

Oshima, S.

AIR POLLUTION AND DISTANCE OF VISIBLE LENGTH. *(Taiki odaku to shingo-to no miekata). Text in Japanese. Ganka Rinsho Iho (Jap. Monatsschr. Prakt. Augenheilkde.), 68(4):378, April 1974.*

Effects of air pollution on the human ability to distinguish among colored lights at distances up to 1800 m were studied. Yellow light could be distinguished at the longest distance, followed by red and green light, respectively. Correlations between strength of illumination, background visibility, distance, and sulfur dioxide are examined.

39816 **APTIC NO. 62385**

Petzow, Guenther and Hans Zorn

TOXICOLOGY OF BERYLLIUM CONTAINING SUBSTANCES. *Zur Toxikologie berylliumhaltiger Stoffe). Text in German. Chemiker-Ztg. (Heidelberg), 98(5):236-241, 1974. 24 refs.*

With an average fraction of about 6 ppm in the earth crust, beryllium belongs to the less frequent elements. No reliable data exist concerning the concentration of beryllium in the atmosphere. Reports on an increase of the beryllium concentration in the atmosphere must be evaluated with care. In the form of dusts, vapors, and solvents, beryllium-containing substances may lead to serious diseases. Penumonitis is the severest of all beryllium-induced diseases. In animal experiments, lung cancer could be induced through inhalation of beryllium-containing vapors. In humans the frequency of lung cancer among beryllium-exposed persons was no higher than in a comparable control group. Chronic lung damage, berylliosis, may occur after long-term inhalation of very small beryllium concentrations. Beryllium may also cause contact dermatitis. Beryllium is resorbed by way of the lung, the stomach, intestines, and by the skin. Resorption by the skin and contact with aqueous beryllium solutions raised the beryllium intake steeply within 1 hour. After 90 min a uniform beryllium flow from the salt solution through the skin into the organism was observed.

39817 **APTIC NO. 62870**

Promyslova, A. D.

LUNG TISSUE REACTION DURING THE EARLY STAGES OF THE ACTION OF CERTAIN POLYMER DUSTS. *(Reaktsiya tkani legkikh v ranniye sroki vozdeystviya pyli nekotorykh polimerynykh materialov). Text in Russian. Gigiena i Sanit., no. 3:110-111, 1974. 2 refs.*

The effects of three different polymer dusts (FP-4 and two substituted phenol resins VDU and FKU) on the lung tissues of albino rats to which these dusts were administered intratracheally in single 50 mg doses were studied. All three dusts induced similar effects; desquamation of the bronchial epithelium, transformation of the cuboidal epithelium into cylindrical epithelium in the bronchioli, thickening of the blood vessel walls, focal sclerosis, and increase in the number of the neutrophils and polynuclear giant cells. The VDU and FKU polymers had slight cytopathogenic action, while FP-4 caused a slight degree of focal sclerosis.

39818 **APTIC NO. 62404**

Rudolph, Stephen A. and Stanley J. Gill

A CALORIMETRIC STUDY OF THE BOHR EFFECT FOR THE REACTION OF HUMAN HEMOGLOBIN WITH CARBON MONOXIDE. *Biochemistry, 13(11):2451-2454, May 1974. 22 refs.*

The heat of reaction between carbon monoxide and human hemoglobin in various buffer solutions was measured using a gas-liquid microcalorimeter. The buffer solutions covered the range pH 6-9. At each pH, pairs of buffers were chosen with widely differing heats of ionization. The hydrogen ions released upon CO uptake were absorbed by buffers of differing heats of ionization with differing observable heats. From these heat measurements, the number of protons released per mole of ligand bound was calculated. The values determined calorimetrically agreed with titration measurements. The heat of reaction between CO and Hb, excluding heats of proton uptake by buffers, varied from -17.7 to -23 kcal/mol of CO from pH 6.35 to 9.20. This variation agreed with the predictions of the model used by Antonini whereby the origin of the Bohr effect is explained based on two ionizable groups in the hemoglobin molecule. A constant value (within experimental error) for the enthalpy of reaction of CO and Hb, after correction for ionization processes in the protein, was -23.2 + or - 1.5 kcal/mol of CO over the range pH 6-9 at 25 deg. (Author abstract)

39819 **APTIC NO. 62498**

Sherwin, Russell P. and Lester J. Layfield

PROTEINURIA IN GUINEA PIGS EXPOSED TO 0.5 PPM NITROGEN DIOXIDE. *Arch. Environ. Health, 28(6):336-341, June 1974. 13 refs.*

Urinary proteins were quantitated by disc-gel electrophoresis, chemical tests, and specific gravity determinations. In the first of two experiments, the seven animals exposed to continuous 0.5 ppm nitrogen dioxide, three for seven days and four for 14 days, had consistently higher levels of urinary protein than control animals (P less than .01). The increase involved all three of the major protein groups demonstrated by the disc-gel procedure, putatively albumins, combined alpha- and beta-globulins. A second experiment involving 12 pairs of guinea pigs have similar results for two of three animal groups (P less than .05) despite a decrease in exposure to only four hours a day. Routine histological studies of the kidneys showed negative results. The pattern of protein excretion detected is consistent with plasma and offers no insight into histuria, i.e., origin of some protein from the renal parenchyma. A similar type of urinary protein pattern has been noted in studies of kidney diseases. (Author abstract modified)

39820 **APTIC NO. 62375**

Shishido, Masao, Kido Sugita, Fumio Higuchi, and Arata Ogihara

EFFECTS OF PHOTOCHEMICAL SMOG ON THE RESPIRATORY FUNCTION--THE OBSERVATION WITH FLOW-VOLUME CURVE. *(Kokagaku sumoggu no kokyu kino ni oyoboso eikyo-flow volume curve ni yoru kansatsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(5):89-95, May 1974. 16 refs.*

To see the effects of photochemical smog on human respiratory functions, 12 healthy male and female pupils of a junior high school in Yokohama were examined. The environment of this school is considered very clean, with an annual daily average of 0.2-0.3 mg sulfur trioxide/100 sq cm. Between April and summer of 1972, photochemical smogs frequently occurred and close to 20 children were affected on each occasion. The location of incidents were always the farthest half of the playground from the school building, when the children were exercising. The 24 pupils were given flow-volume curve tests, an/ urine protein, sugar, urobilinogen, and pH were measured. The SO2 levels were measured automatically, and oxidants were measured by oxidant digital recorder. On days with high oxidant concentrations 10 children had decreases in pulmonary functions, and obstructions appeared in the respiratory system. The use of flow-volume curve was effective in examining respiratory function damages caused by photochemical smogs.

39821 **APTIC NO. 62164**

Stephens, Robert J., Marlene F. Sloan, Michael J. Evans, and Gustave Freeman

EARLY RESPONSE OF LUNG TO LOW LEVELS OF OZONE. *Am. J. Pathol., 74(1):31-58, 1974. 44 refs.*

The epithelial response in the terminal bronchioles and alveoli was examined after exposure of rats to approximately 0.5 and 0.9 ppm ozone. Loss of ciliated cells from the terminal bronchiole was pronounced after 6 to 10 hours of exposure; however, noncilated cells were resistant to injury from O3. In contrast, type-1 alveolar lining cells were very sensitive to O3 and were severely damaged or removed from significant areas of the proximal alveoli after as little as 2 hours of exposure to 0.5 ppm. The basement lamina was left devoid of an epithelium with the exception of type-2 cells, which were very resistant and retained a relatively normal appearance. Under continuous exposure, repair of the lesion area was accomplished in approximately 48 hours through proliferation of the type-2 cells. The new cells were cuboidal at first but subsequently became more squamous in appearance. Exposure for 8 to 10 hours followed by residence in clean air resulted in a proliferative response at 48 hours, about equal to that observed after continuous exposure. (Author abstract)

39822 **APTIC NO. 62363**

Suzuki, T., R. Endo, and S. Nagaoka

EFFECTS OF OZONE-EXPOSURE ON ENZYMES IN SERUM. *(Ozon bakuro no Kesseichu koso eno eikyo). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. for Environ. Prot.), vol. 5:203-205, March 1974. 5 refs.*

It was postulated that a change in enzyme activity would appear prior to functional, structural, and pathological changes when damages to the cirulatory systems occur due to the exposure of organism to ozone. Because these enzymatic changes would be utilized, if any, as index or indicator of ozone-damage, the changes of enzymes, GOT, GPT, ALP and LDH, in serum were determined before and after the exposure of male and female rats 10 weeks after birth to 5 + or - 0.2 ppm of ozone in a chamber for 3 hr. The blood obtained by vacuum collection via cardial puncture was centrifuged at 3000 RPM for 10 min to separate the serum. Some organs were removed, fixed and buried in paraffin, then dyed with HE, PAS or Sudan III. The enzymes GOT and GPT showed increased activity in the groups of male and female rats exposee to ozone, ALP showed decreased activity in rats of both sexes exposed to ozone, and LDH showed no change of activity after exposure to ozone. Common changes of three rats exposed to ozone included vacuolation of hepatic cells in all three cases, localized wax-like denaturation of the myocardium in one case, denaturization of the tubular epithelium of the kidney, exudation of serum-like substance into the renal cavity and stagnation, increase of the giant cells with spleen, and localized sporadic ablation and omission of alveolar epithelium in lung. The general findings in each organ, especially in the respiratory system, were swelling of connective tissue around the blood vessels without any marked change in thymus. The reason of these enzymatic activity changes was discussed with regard the whole effects of ozone exposure on the body.

39823 **APTIC NO. 61850**

Tanaka, M. and H. Dodo

EFFECTS ON RESPIRATORY SYSTEM OF AIR POLLUTION IN THREE CITIES, OTAKE, KURE AND FUKUYAMA (IN 1972). *(Otake, Kure oyobi Fukuyama-shi ni okeru taiki osen no kokyuki ni oyobosu eikyo- showa 47nendo). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 27(2):139-146, Feb. 1974. 4 refs.*

The effects of air pollution in three cities (Otake, Kure, and Fukuyama) were investigated from Oct. to Nov. 1973 by dividing the cities into polluted and unpolluted sections and randomly selecting 50 female subjects older than 40 from each section as subjects. The random selection should remove the effects of smoking and occupational exposures to pollutants from the investigation. The items of investigation were questionnaires, B.M.R.C., simplified lung function examination, body height, blood pressure, urinalysis, roengenography, and subjective symptoms of eyes, nose, and pharynx. Response to the questionnaire was 91.1%. There was high morbidity of cough, sputum, gasp, stridor, nasal catarrh, history of heart disease, and bronchitis in the polluted areas. There were many polluted areas where the ratio of abnormal respiratory curves was higher. The percentage of complaints of subjective symptoms of eyes, nose, and pharynx was relatively high. The complex symptoms of chronic bronchitis were not frequent, but were more frequent than those found in a similar investigation in 1972. The number of items which showed significantly different morbidities between polluted and unpolluted areas was higher in this investigation than in its counterpart in 1972.

39824 **APTIC NO. 62510**

Ter Haar, Gary and Regine Aronow

NEW INFORMATION ON LEAD IN DIRT AND DUST AS RELATED TO THE CHILDHOOD LEAD PROBLEM. *Environ. Health Perspect., no. 7:83-89, May 1974. 13 refs.*

It has been known for many years that the eating of leaded paint is the prime cause of lead poisoning and elevated blood levels of children living in deteriorated housing. Reecently, there has been speculation that children may eat dirt and dust contaminated with lead exhausted from cars and that this amount of ingested lead is sufficient to contribute significantly to the childhood lead problem. A two part study has been conducted to evaluate the validity of the dust-and-dirt hypothesis. The first part of the study was made to determine the source of lead in dirt to which children are normally exposed. Dirt samples were taken in old urban areas around 18 painted frame houses and 18 houses of brick construction. Samples also were taken around seven old frame farmhouses remote from traffic. Based on the fact that lead concentrations in the dirt were smaller in city and rural yards at corresponding distances from the houses, it is clear that nearly all of the lead in dirt around these houses is due to paint from the houses. Lead antiknock additives are therefore not a significant contributor to the lead content of dirt around houses where children usually play. The second part of the study used a naturally occurring radioactive tracer, Pb-210, to determine the relative amounts of dust and other lead-containing materials (e.g., paint) eaten by young children. This tracer is present in very low concentrations in paint and in significantly higher concentrations in fallout dust. Stable lead and Pb-210 were analyzed in fecal material from eight children suspected of having elevated body burdens of lead and ten children living in good housing where lead poisoning is not a problem. The normal children averaged 4 micrograms Pb/g dry feces, with a range of 2 to 7. Of the eight children suspected of having elevated lead body burdens, two had fecal lead values within the normal range. However, the remaining six were 4 to 400 times as high. Despite these differences in fecal lead between the two groups, the groups were essentially identified in the Pb-210 content of their feces. The elevated children averaged 0.040 pCi of Pb-210 dry feces, while the normal group averaged 0.044 pCi/g. The results provide sound evidence that these children suspected of elevated lead body were not ingesting dust or air-suspended particulate. (Author abstract)

39825 **APTIC NO. 62369**

Tomita, K., T. Kawaraya, and T. Haruki

EFFECTS OF AUTOEXHAUST ON POLICEMEN IN OUTSIDE DUTY, PART I: CARBON MONOXIDE. *(Jidosha haigasu no gaikin keisatsukan ni oyobosu eikyo; 1. Isanka tanso). Text in Japanese. Japan Society for Industrial Hygiene, Tokyo, Japan Soc. Ind. Hyg. Annu. Meet., 47th, Nagoya, Japan, 1974, p. 204-205. (March 29-31, Paper 301.)*

The carbon monoxide content of the expired air of policemen working indoors and in the ambient air was measured before and after their duty shifts to examine the effects of low CO concentrations. The concentration of CO on city streets from 8 am to 7 pm was 11.5 + or - 6.3 ppm, and in the stationhouse it was 5.6 + or - 1.2 ppm. There was a marked difference of CO concentrations in the exhalations of smokers and non-smokers. The CO concentration in expired air befory duty was 6.2 + or - 2.5 ppm, and 9.8 + or - 3.3 ppm after the work day, especially if the assignment was outdoors. There was a statistically significant correlation between the values of CO in expired air and the environmental concentration. The only significant differences between duty assignments appeared between inside and outside duty. The average annual CO concentration in expired air from policemen on outside duty was 8-12 ppm, 1.5 times that of men working indoors.

39826 **APTIC NO. 62370**

Tomita, K., T. Kawaraya, and T. Haruki

EFFECTS OF AUTO EXHAUSTS ON POLICEMEN IN OUTSIDE DUTY, PART II: LEAD. *(Jidosha haigasu no gaikin keisatsukan ni oyobosu eikyo; 2. Namari). Text in Japanese. Japan Society for Industrial Hygiene, Tokyo, Japan Soc. Ind. Hyg., Annu. Meet., 47th, Nagoya, Japan, 1974, p. 206-207. (March 29-31, Paper 302.)*

Blood samples were collected from policemen and policewomen who work in and around Osaka to determine the effects of lead from vehicle exhausts. The specific gravity of whole blood, red blood cells, hemoglobin, and lead in the blood were measured, along with lead and coproporphyrin in the urine, and the data were classified by sex, job classification, and location of duty. No cases were found where there were more than 60 micrograms of lead/dl of blood, more than 150 micrograms of lead/l in the urine, or more than 150 micrograms coproporphyrin in the urine. Six policewomen were anemic, having a specific gravity of whole blood less than 1.050, a red blood count of less than 3.70 million, and hemoglobin less than 11.0 g/dl. Ten policemen were also diagnosed as having anemia, with a specific gravity of whole blood less than 1.053, a red blood count of less than 4.20 million, and hemoglobin less than 12.5 g/dl. However, the lead contents of the blood and urine and coproporphyrin in the urine were normal, and differences in duty assignments had no effect. Blood lead content was highest for city patrolmen, followed by city traffic police. Exposure to 10 micrograms of Pb/cu m did not affect the blood lead levels. Lead contents in the urine correlated to the blood lead levels. Coproporphyrin in the urine did not correspond to either the blood or urine lead levels, suggesting its inapplicability as an index of exposure to aerial lead. No differences were found in the hematology of the subjects with relation to their duty assignments.

39827 **APTIC NO. 62371**

Tomita, K., T. Kawaraya, T. Haruki, and M. Oka

EFFECTS OF AUTO EXHAUST ON POLICEMEN IN OUTSIDE DUTY, PART III: ON THE RESPIRATORY FUNCTION SEEN FROM ONE SECOND RATE, VITAL CAPACITY RATIO AND SUBJECTIVE SYMPTOMS ON RESPIRATORY SYSTEM. *(Jidosha haigasu no gaikin keisatsukan ni oyobosu eikyo; 3. Ichibyo-ritsu, hai katsuryohi, kokyukikei jikaku shojo yori mita kokyu kino). Text in Japanese. Japan Society for Industiral Hygiene. Tokyo, Japan Soc. Ind. Hyg., Annu. Meet., 47th, Nagoya, Japan, 1974, p. 208-209. (March 29-31, Paper 303.)*

Policemen on duty in and outside of Osaka were examined to determine vital capacity ratio, gas volume per second, and subjective symptoms. The vital capacity ratio was calculated by dividing the actual value by the standard value appropriate to individual height and weight. The vital capacity ratio and the 1- second rate for all subjects older than 40 were lower than those obtained from persons under 39. The 1-second rate, thought to be the most effective index of air pollution, was lower in persons over 40. It was also lower for nonsmokers younger than 39. Eighty percent of the persons below the standard deviation for the 1-second rate were smokers, older than 40, and work outdoors in the city. Eighty percent of the persons below the standard deviation of vital capacity were older than 40 and worked in the city.

39828 **APTIC NO. 62372**

Tomita, K., T. Kawaraya, and T. Haruki

EFFECTS OF AUTO EXHAUST ON POLICEMEN IN OUTSIDE DUTY, PART IV: FATIGUE SEEN FROM THE FREQUENCY OF COMPLAINTS OF SUBJECTIVE SYMPTOMS. *(Jidosha haigasu no gaikin keisatsukan ni oyobosu eikyo: 4. Jikaku shojo soritsu yori mita hiro). Text in Japanese. Japan Society for Industrial Hygiene, Tokyo, Japan Soc. Ind. Hyg., Annu. Meet., 47th, Nagoya, Japan, 1974, p. 210-211. (March 29- 31, Paper 304.)*

Subjective symptoms of fatigue and related anomalies were studied in policemen on indoor and outdoor duty in Osaka. The major symptoms included sleepiness, weariness, difficulties in concentration, and a sense of unreality. Frequency of complaints occurred in the order of exhaustion, sense of unreality, and lack of concentration, and all were most often found in motorcycle police. Frequency of all complaints rose after duty. Eye fatigue and stiffness in one shoulder was reported in 50% of the subjects. Excretion of protein in the urine increased after daily duty, and the increase was higher in men working outdoors and when measured in the summer. The critical flicker frequency decreased slightly.

39829 **APTIC NO. 61810**

Tsuchiya, K., M. Sugita, S. Seki, and T. Umezawa

RELATION BETWEEN THE LEAD IN BLOOD AND ENVIRONMENTAL AND BIOLOGICAL FACTORS.

(Kecchu en to kankyo narabini seibutsugakuteki inshi tono kankei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 29(1):136, April 1974.

Two thousand three hundred policemen in Tokyo were divided by indoor and outdoor duty, and their blood was analyzed for total hyperopia, red blood cells, hemoglobin, and lead. Lead and activity of delta-aminolevulinic acid dehydrogenase in their urine was determined. The lead content of the blood in policemen who serve in the inner city was slightly higher than that of those who work in the western district of Tokyo. Blood lead in those who live in the inner Metropolis was higher than in people from other areas. The lead content of urine was higher in policemen who live in inner Metropolis than those who live in other areas, but the activity of delta-aminolevulinic acid dehydrogenase in urine was higher in policemen who serve in the western district of Tokyo than in those who serve in the inner city. When Tokyo metropolis was divided into western-inner, eastern-inner, western, and eastern, sections with a detached island, there was a correlation between lead in the blood and the aerial concentration of lead with a correlation coefficient of 0.89. Both the lead content of blood in policemen in the eastern inner metropolis and the aerial lead concentration were the highest. However, as there is almost no difference of motor traffic in both sections of the inner metropolis, other factors must have caused the differences.

39830 **APTIC NO. 62138**

Uzhdavini, E. R., I. K. Astaf eva, and A. A. Mamayeva

ACUTE TOXICITY OF THE LOWEST PHENOLS. *(Ostraya toksichnost nizshikh fenolov). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 2:58-59, 1974. 6 refs.*

The acute inhalatory, oral, and skin toxicity of cresol and xylenol isomers was studied in mice and rats. Xylenol vapor concentrations in the order of magnitude of 0.01 mg/l caused no acute poisoning, while mixtures of vapors and aerosols, formed during heating, caused deaths of the test animals, primarily due to skin penetration. The LC50 of o-cresol was 0.179 mg/l. Irritation of the mucosa, dilation of the vessels in the ears and limbs, hematuria, and convulsions were the leading symptoms in inhlation tests. Dimethylphenols primarily caused depression of the functions of the central nervous system. In tests using 10% solution in oil, the LD50 values were 436 mg/kg for phenol, 344 mg/kg for o-cresol, 828 mg/kg for m-cresol, 344 mg/kg for p-cresol, 809 mg/kg for 2,4-xylenol, 1140 mg/kg for 2,5-xylenol, 980 mg/kg for 2,5-xylenol, 948 mg/kg for 3,4-xylenol, and 836 mg/kg for 3,5-xylenol in mice; as well as 1470 mg/kg for o-cresol, 2010 mg/g for m-cresol, 1460 mg/kg for p-cresol, 3200 mg/kg for 2,4-xylenol, 1270 mg/kg for 2,5-xylenol, 1750 mg/kg for 2,6- xylenol, 1620 mg/kg for 3,4-xylenol, and 1915 mg/kg for 3,5-xylenol in rats. For skin application, the LD50 values were 620 mg/kg for o-cresol, 1100 mg/kg for m-cresol, 750 mg/kg for p-cresol, and 1040 mg/kg for 2,4-xylenol. The corresponding value for 2,6-xylenol in ethanol was 920 mg/kg.

39831 **APTIC NO. 62511**

Vostal, Jaroslav J., Ellen Taves, James W. Sayre, and Evan Charney

LEAD ANALYSIS OF HOUSE DUST: A METHOD FOR THE DETECTION OF ANOTHER SOURCE OF LEAD EXPOSURE IN INNER CITY CHILDREN. *Environ. Health Perspect., no. 7:91-97, May 1974. 15 refs.*

A method has been developed to test the hypothesis that lead-containing house dust is responsible for the elevated levels of lead in blood of inner city children. Dust analyses of smears from the floors, walls, and windowsills in low-income inner city dwellings have shown a median concentration of lead five times as high as in suburban homes. Two groups of houses and children were tested; the inner city households were those with children between 9 months and 6 years of age in which at least one child had previously been found to have a blood level of 40 micrograms lead/100 ml of blood or over. The suburban group consisted of children of the same age range living in more recently built homes. A significant relationship was found between individual hand and house smears. The level of hand contamination clearly correlates with household levels. The data do not confirm that the contamination of hands by lead-containing house dust is the exclusive source of undue exposure of inner city children. Many other environmental factors must be considered. The fact that the increased exposure is characteristic only for the age group between 1 and 5 years makes the other general sources such as air and water improbable. On the other hand, the ubiquitous presence of lead and the ease of repetitive contamination of hands present the assumed hand-to-mouth route of exposure as one of the most important environmental mechanisms involved in the genesis of moderately increased exposure in this high-risk population group.

39832 **APTIC NO. 61847**

Wakizaka, I.

A STUDY ON THE STIMULATING ACTIVITY OF SULFUR DIOXIDE GAS TO UPPER AIRWAY. *(Aryusangasu no jokido shigeki-sei ni kansuru kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 29(1):102, April 1974. (Presented at the Japan Society of Hygiene, Annual Meeting, Nagasaki, Japan, April 2-4, 1974, Paper 207.)*

The stimulating action of sulfur dioxide on the upper airway is detectable by a decrease in the respiration number. The suppression occurs via the trigeminal nerve leading pathway from receptors distributed on the upper airway. In mice, a distinct dose-response relation was found between the SO2 concentration and the maximum reduction rate. A time-response relation was also found such that the higher the concentration of inhaled SO2, the shorter the time from beginning of exposure to maximum reduction. The receptors of stimulation by SO2 must be distributed on the upper airway because the response stops when SO2 is introduced directly by tracheal cannula. The suppression is transient and there is gradual recovery even under continued inhalation of SO2. The suppression is rapidly restored, however, by discontinuing the exposure for a few minutes, showing that a rapidly reversible process exists in the receptor. When repeated short exposures were given the sensitivity gradually decreased to zero. The degree of decrease per exposure did not depend on the SO2 concentration but had a definite value. The decrease of respiration number also occurs when SO2 concentration is increased, but the decrement is smaller than when the high concentration of SO2 is administered from the start.

39833 **APTIC NO. 61903**

Yoshida, A., T. Motomiya, M. Adachi, and K. Hayashi

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH IN CHIBA CITY. *(Chiba- shi ni okeru taiki osen no jintai eikyo chosa). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 29(1):110, April 1974.*

The results of investigation on the morbidity ratio of bronchial asthma of all primary schoolchildren in Chiba City (49,595 boys and girls) from Sept. 1972 to March 1974, and those of respiratory symptoms of adults between 40 to 59 years old who lived more than 3 years in industrial, rural, and city areas in the city are described. The year average concentration of sulfur oxides (sulfur trioxide mg/100 sq cm/day by the lead dioxide method) during 1970-1972 were 1.0-2.0, 0.7-1.0, and less than 0.5 in industrial, city, and rural areas, respectively. The children's morbidity ratio increased from 0.56 (1964), through 1.17 (1968), to 2.02 (1972). There was a positive correlation between the morbidity of boys and the concentration of sulfur oxides in the 11 schools which were located within 500 m of the monitoring point. All combinations of adult respiratory symptoms showed signficant differences between those living in industrial areas and those in rural areas. Also, many combinations showed significant differences between those in industrial areas and those in city areas and between those in city areas and those in rural areas. In the industrial area and in the city a municipal relief system has been established for the injuries due to air pollution, and 361 patients have been officially recognized.

39834 **APTIC NO. 62851**

Japan Environmental Agency, Bureau of Air Quality

IMPLEMENTATION PROCEDURES FOR PUBLIC HEALTH SURVEY INVOLVING AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTIONS. *(Kokagaku hanno ni yoru taiki osen kenko chosa jisshi yoryo). Text in Japanese. 8p., May 1974.*

An outline of implementation procedures for a public health survey in relation to photochemical smogs is presented. In Tokyo and Osaka, epidemiological examinations of about 1300 schoolchildren will be made during photochemical smog season for 70 days. The measurements of sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, oxidants, total hydrocarbons, suspended particulates and methane will be taken. Manual analyses will be conducted for total aldehydes, sulfuric acid salt, acid mist, nitric acid salt, and cyanide. Weather conditions such as the atmospheric temperature, humidity, solar radiation, wind velocity and direction, visibility, and ultraviolet rays will be observed. The methods of health examination will be children's health diaries; clinical examinations of the respiratory, circulatory, and neurological systems; and opthalmological and otorhinolaryngological studies. The total of 160 children with any damaging symptoms and the total of 16 hospitalized children from the two cities will be given further detailed clinical examinations on matters described above.

39835 **APTIC NO. 62892**

Japan Environmental Agency, Tokyo

SUMMARIZED RESULTS OF THE 1973 PUBLIC HEALTH SURVEY INVOLVING AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTION. *(48-nendo kokagaku hanno ni yoru taiki osen kenko chosa kekka). Text in Japanese. 5p., June 1974.*

A summary of progress reports from the occupational group investigation division, the area immunological investigation division, and the applied immunological investigation division is presented in a table. The occupational group investigation division investigated 64 patrol policemen between July 15 and Aug. 14, 1973, and found a high rate of eye irritation at the time of photochemical smog warning. An investigation of 205 Osaka police patrols between Aug. 20 and Sept. 18 found a correlation between photochemical smog warnings and high rate of throat symptoms, but other factors were also suspected. There was no correlation between the oxidant levels and subjective symptoms of workers for two investigations of outdoor workers. A clinical investigation group studied the records of 81 cases of acute symptoms since 1970 that were suspected to be photochemical pollution victims. Clinical local symptoms common to many were eye pain, lachrymation, throat pain, and cough. The symptoms involving the entire body common to these cases were headache, dizziness, numbness, spasms, loss of consciousness, fatigue, nausea, fever, and chills.

1973

39836 **APTIC NO. 61904**

Aleksandrov, N. P.

SELECTING TEST ANIMALS FOR THE ELABORATION OF CARBON MONOXIDE CONCENTRATION STANDARDS. *(Vybor eksperimental nykh zhivotnykh dlya razrabotki normativov okisi ugleroda). Text in Russian. Gigiena i Sanit., no. 11:92-95, 1973. 12 refs.*

Comparative study of the effect of carbon monoxide on albino mice, albino rats, hamsters, cats, dogs, guinea pigs, and rabbits was performed with view to the selection of adequate species for the determination of maximum allowable concentration of CO for the human organism. The rates of CO uptake in the blood decreased in the order albino mice, hamsters, albino rats, cats, dogs, guinea pigs, and rabbits, all exposed to 2 mg/l concentrations of CO. The maximum carboxyhemoglobin concentrations were 71% in mice, 58% in cats, 50% in guinea pigs, and 35% in rabbits. The differences were due to the affinity of CO with hemoglobin, the rates of metabolism, body weight, pulse rate, and rate of respiration. Leveling-off of the species-specific differences during acute exposure and identical blood COHb levels was observed; the first symptoms of poisoning appeared in most species at COHb levels of 20-30%, and most animals assumed lateral positon at COHb levels of 40-50%. The animals died as soon as the COHb level reached 60-75%. Maximum allowable concentrations of CO, to be established in tests with albino mice and rats, are sure to be safe for the human organism.

39837 **APTIC NO. 61039**

Ascik, K.

SAFETY AND HYGIENE OF LABOR. TOXIC PROPERTIES OF CHLORINE DIOXIDE EVOLVED IN THE PROCESS OF BLEACHING. *(Bezpieczenstwo i higiena pracy. Wlasciwosci toksyczne dwutlenku chloru wydzielajacego sie w procesie bielenia). Przegl. Papier. 29(3):100-101, 1973. 17 refs. Translated from Polish, 9p.*

The toxic properties of chlorine dioxide include irritation of the mucous membranes, eye irritation, and nose and throat irritation. Investigations of the toxic action on cats, rabbits, mice, and guinea pigs are reviewed. Cases of poisoning among persons employed in the production of hypochlorites or in the bleaching of fabrics in textile plants are described. Maximum permissible concentrations for ClO_2 have been proposed at 0.0001 mg/l and at 0.003 mg/l. First aid treatment and methods for protecting workers from ClO_2 are mentioned.

39838 **APTIC NO. 62649**

Back, Kenneth C.

ENVIRONMENTAL TOXICOLOGICAL IMPACT OF AIRCRAFT OPERATIONS. *North Atlantic Treaty Organization, Neuilly sur Seine (France), Advisary Group for Aerospace Research and Development, Proc. AGARD Propul. Energ. Panel Meet., London, England, 1973, AGARD-CP-125, p. 35-1-35-6. 17 refs. (April 9-13.)*

NTIS, DDC: AD-769 278

The environmental toxicological impact of aircraft operations is discussed with emphasis on carbon monoxide. Pollution from aircraft engines is not a problem of acute toxicity. Rather, the toxicity is manifest only as it adds to the whole complex of chronic air pollution effects. The Air Force is conducting studies in three major areas: the effects of continuous long-term CO exposure on various animal species; the effects of continuous long-term CO exposure on the performance of rhesus monkeys; and the effects of short-term low-level CO exposure on humans. A rapidly plateauing carboxyhemoglobin saturation of approximately 22% in all animals was evidenced after a continuous 100-day CO (200 mg/cu m concentration) exposure study.

39839 **APTIC NO. 61018**

Boettger, P.

DETERMINATION OF ZINC IN HUMAN SPERM. *(Zinkbestimmungen in menschlichem Sperma). Med. Welt (Stuttgart), vol. 24:374-376, 1973. 9 refs. Translated from German, 10p.*

Spermatograms were made, and the residual material was analyzed for zinc. Determinations of the zinc in the sperm revealed significant relationships between sperm count and quantity of zinc. It is possible that there is a catalytic function carried out by the zinc in the metabolism of the spermatozoa or spermatogenesis. Possible relationships between abnormalities of spermatozoa and quantities of zinc can only be determined after a more extensive series of investigations on non-standard spermatograms.

39840 APTIC NO. 62683

Burns, Barry and Gail H. Gurtner

A SPECIFIC CARRIER FOR OXYGEN AND CARBON MONOXIDE IN THE LUNG AND PLACENTA. *Drug Metab. Disposition, 1(1):374-379, 1973. 9 refs.*

The extent to which some commonly used drugs (chloropromazine, dl-amphetamine, imipramine), substances in cigarette smoke (nicotine, 3,4-benzpyrene), a commonly used plasticizer (bis-2-ethylhexyl phthalate), and a drug known to bind to cytochrome P-450 in vivo acutely interfere with a specific transport mechanism for oxygen and carbon monoxide in the lung and placenta were investigated. Carbon monoxide transfer in the lung was studied in vivo using a rebreathing method for pulmonary diffusing capacity in dogs and sheep, while O2 transfer across the placenta in term ewes was measured using a perfusion system. Evidence is presented in favor of a mechanism in the lung to facilitate diffusion of CO which supports the additional concept of facilitated diffusion of O2. The O2 transport system may help to explain the effects of smoking and narcotics addition on birth weight in human infants, since several narcotic drugs and substances in cigarette smoke are able to reduce placental O2 transfer acately.

39841 APTIC NO. 61624

Chahinian, P. and J. Chretien

PRESENT FREQUENCY OF BRONCHIAL CANCER. EPIDEMIOLOGIC DATA AND ETIOLOGIC FACTORS. *(Frequence actuelle du cancer bronchique. Donnees epidemiologiques et facteurs etiologiques). Text in French. Rev. Prat., no. 23:1113-1114, 1117-1118, 1121-1122, 1125-1126, 1129, March 1973. 41 refs.*

Epidemiological and etiological studies on bronchial cancer are reviewed. The frequency of bronchial cancer, prevalent in males, and especially in industrialized areas, has increased since about World War I. While bronchial cancer is most frequent at the age of about 65 and over, it is rare in subjects younger than 40. The increase in the frequency of bronchial cancer is parallel with the increase in the cigarette consumption. Air pollutants, such as benzo(a)pyrene and related aromatic polycyclic hydrocarbons present in combustion gases and automobile exhaust gases, as well as heavy metals, such as radioactive elements, nickel and its compounds, chromium, iron, arsenic, beryllium, and asbestos, encountered primarily in occupational environment, are also responsible for bronchial cancer. Inhibition of the pulmonary degradation of benzo(a)pyrene by nickel carbonyl was observed. Genetic factors in human bronchial cancer may be non-existant or be suppressed by environmental effects and the effects of cigarette smoking.

39842 APTIC NO. 61011

Chen, Chentung, Taichi Nakajima, Shigeko Kusumoto, Yasuo Tsubota, and Esuko Yonekawa

STUDIES ON THE RECOVERY PROCESS OF HISTOPATHOLOGICAL CHANGES OF THE RESPIRATORY ORGANS OF MICE AFTER EXPOSURE TO NITROGEN DIOXIDE. WITH SPECIAL REFERENCE TO CHRONIC TRACHEITIS AND BRONCHITIS. *1973 (?). 5 refs. Translated from Japanese, 11p.*

Mice were exposed to 1.0-1.5 ppm nitrogen dioxide continuously for 1 mo. Five were killed and examined immediately after exposure. The rest were divided into two groups of five each, were kept in a clean air chamber for 1 mo and 3 mo, and then were killed and examined. Histopathological examinations were made of the lungs and trachea of the mice. Desquamative bronchitis, bronchitis, and decomposition and degeneration of the mucous epithelium were noted in the lungs and trachea of mice exposed to NO2 for 1 mo. Chronic tracheitis and bronchitis were noted after termination of the exposure. These were caused by an autoimmunization reaction. It took a significantly long period of time to recover from the respiratory trouble caused by NO2. The period of recovery time differed due to individual differences.

39843 APTIC NO. 61023

Eybl, V., J. Sykora, and F. Mertl

THE INFLUENCE OF CALCIUM AND ZINC COMPLEXES OF AMINOPOLYCARBOXYLIC ACIDS ON EXCRETION AND DISTRIBUTION OF CADMIUM. *(Einfluss der Ca- und Zn-Komplexe von Aminopolykarbonsaeuren auf Ausscheidung und Verteilung des Kadmiums). Acta Biol. Med. Ger., vol. 30:515-525, 1973. 28 refs. Translated from German, 16p.*

The influence of calcium and zinc complexes of the aminopolycarboxylic acids (APA) (EDTA, CDTA, DTPA) and of zinc chloride on the retention of cadmium in the organism and its distribution in the organs was compared in experiments on mice. In an acute experiment, in which these substances were given intraperitoneally in a single dose with simultaneous intravenous administration of cadmium(115) chloride (with a carrier), most of the complexes lowered the retention of cadmium, with CaDTPA and ZnDTPA being the most effective substances. In a subacute experiment, in which the substances were given intraperitoneally in five doses from day 9 to day 20 after intravenous injection of Cd(115)Cl2 (with carrier), DaDTPA, ZnDTPA, and ZnEDTA enhanced the excretion of cadmium from the organism. Zinc chloride, in a subacute experiment, effected a significant retention of cadmium in the organism and to some extent altered its distribution in the organism. In the urine of rats, to which cadmium chloride had been administered subcutaneously, and to which the other calcium and zinc complexes had been administered intraperitoneally, the formation in the organism of cadmium complexes, ionic associates of calcium and zinc complexes of APA with potassium, calcium, magnesium, and binucleate chelates of the APA employed, was demonstrated.

39844 APTIC NO. 62269

Fenters, James D. and Robert Z. Maigetter

INTERACTIONS OF VARIOUS AIR POLLUTANTS ON CAUSATION OF PULMONARY DISEASE (FINAL REPORT). *IIT Research Institute, Chicago, Ill., Environmental Protection Agency Contract 68-02-0666, EPA-650/1-73-002, IITRI-L6069-4, 54p., Sept. 1973. 2 refs.*

NTIS: PB-230 933/AS

Four experiments were conducted with mice to determine the interactions of various air pollutants on causation of pulmonary disease. Continuous exposure of mice for 10 mo to 2 ppm nitrogen dioxide did not influence formation of antibodies or levels of immunoglobulins, nor their resistance to subsequent respiratory challenge with live influenza virus. Conversely, continued exposure to 0.5 ppm NO2 with daily 1-hour peaks of 2 ppm NO2 depressed the ability to form SN antibodies and significantly altered levels of several immunoglobulins. The differences among the hemagglutination-inhibition and serum neutralization antibody titers between control and experimental mice were not significant with mice vaccinated with A2/Taiwan influenza vaccine and exposed for 4 wk to either 2 ppm NO2, 0.5 ppm NO2 with 1-hour peaks of 2 ppm NO2 for 5 days/wk, or to filtered air. Mortality rates were determined in mice continuously exposed for up to 9 mo to either 2 ppm NO2, 0.5 ppm with daily 1-hour peaks of 2 ppm NO2, or filtered air. There was an increase in mortality rates among mice exposed to 2 ppm NO2, and to a lesser degree among those exposed to 0.5 ppm NO2 with daily 1-hour peaks of 2 ppm NO2. A 3-hour exposure to manganese oxide or manganese dioxide aerosols resulted in increases of susceptibility to bacterial pneumonia and influenza infection. The increase in susceptibility was demonstrated by increased mortality rates and decreased mean survival time after challenge with airborne K. pneumoniae and increased mortality rates and lung lesion scores after challenge with airborne influenza virus.

39845 **APTIC NO. 62035**

Freour, P., M. Serise, J-F Tessier, P. Coundray, J.-R. Mallet, and P. Bordas

EPIDEMIOLOGICAL STUDY OF CHRONIC BRONCHOPATHIES AND SOME PROPHYLACTIC CONSIDERATIONS. *(Approche epidemiologique des bronchopathies chroniques et considerations sur leur prophylaxie). Text in French. Bordeaux Med. (Bordeaux), 6(10):1401-1412, May 1973.*

An epidemiological approach was applied in the investigation of chronic bronchopathies. Studies made in the Gironde demonstrate the importance of these disorders in rural as well as urban communities and the effect they have on respiratory function. Among the multiple risk factors in the genesis of the bronchopathies, these studies emphasized the role of tobacco, living conditions, and air pollution. Chronic bronchopathy prophylaxia should not be limited to the prevention of reinfection in patients suffering from bronchitis, but should be directed toward its early discovery and to dealing with the risk factor themselves.

39846 **APTIC NO. 62613**

Goodacre, C. L.

LEAD IN PETROL: IS IT NECESSARY? *Preprint, National Society for Clean Air, Brighton (England), 46p., 1973. 15 refs. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

Emission exhausts and their effect on human health are discussed. There is no factual evidence today that anyone anywhere is suffering ill health from emissions from vehicles. Neither hydrocarbons or carbon monoxide from motor vehicle exhausts are significant to human health. Nature is the major producer of CO and industry can be significant in local industrial areas. It is doubtful whether smog is caused by unburned hydrocarbons from vehicles in Los Angeles. Very little is known about the nitrogen oxides as pollutants and the contribution from vehicles is insignificant compared to industry. Despite regulations to the contrary, leaded gasoline is not a health problem. Atmospheric Pb levels have remained constant over the last 30 yr. Slight local Pb increases have been noted and human body Pb levels seem to change very little over the years. Nature is the major producer of particulate matter to the atmosphere, followed by industry, with the motor vehicle a insignificant third.

39847 **APTIC NO. 61022**

Gottmann-Luckerath, I., G. Ehring, and G. K. Steigleder

COMPARISON OF PATCH TESTS AND INTRADERMAL TESTS WITH METAL SALTS OF CHROMIUM, COBALT, COPPER AND NICKEL. *Arch. Dermatol. Forschl., vol. 246:159-166, 1973. 9 refs. Translated from German, 10p.*

Patch tests and intradermal tests with metal salts (chromium oxide, potassium chromate, cobalt sulfate, copper sulfate, and nickel sulfate) were performed in 132 patients. In four patients, intradermal testing with a 1:10,000 diluted antigen solution revealed a positive delayed reaction, although the patch test had been negative. Four other cases which reacted to one or more metals in the patch test showed additional positive delayed reactions to other metal salts when tested intradermally. Patch testing with the usual antigen concentration also gave positive results with the antigen diluted ten times and in intradermal tests. Positive patch test reactions, however, with negative delayed intradermal response, occurred in patients with atopic dermatitis, with acute phase of eczema, and with contact allergies to other compounds, which showed a weak reaction to metal salts. Because immediate, nonspecific reactions to intradermal tests were numerous, these reactions were of significance only in connection with delayed reactions. In 11 cases, eczematous lesions flared up to some distance from the site of the intradermal test. Such intradermal tests should not be conducted routinely, but only in order to supplement routine patch testing for detecting allergies to metals in cases with a positive history but negative patch tests and for distinguishing specific from nonspecific patch tests.

39848 **APTIC NO. 62144**

Goyer, Robert A. and Bonnie C. Rhyne

PATHOLOGICAL EFFECTS OF LEAD. *Int. Rev. Exp. Pathol., vol. 12:1-77, 1973. 309 refs.*

The pathological effects of lead are discussed and are most prominent in three organ systems: the nervous system, hematopoietic system, and kidneys. Acute encephalopathy is characterized by cerebral edema, proliferation and swelling of endotheilial cells, dilation of capillaries and arterioles, proliferation of glial cells, focal necrosis, and neuronal generation. Lead produces a microcytic hypochromic anemia which results in a reduction in red blood cell survival and impairment of heme synthesis. The renal effects of Pb consist of acute, reversible tubular dysfunction characterized by the Fangoni syndrome, and of chronic nephropathy with nonspecific changes including interstitial fibrosis and cystic dilation of atrophic tubules. Other pathological effects include a possible reduction in reproductive fitness, altered endocrine function, particularly hypothyroidism, and possibly myocardial changes in persons with acute lead intoxication. There are three phases of Pb toxicity: a covert phase, an adaptive or subclinical phase, and a phase of overt clinical toxicity. Blood levels are a useful measure of toxicity. Concern for potential toxic effects of Pb has arisen from growing awareness of the relatively large amounts of Pb in the environment. There is no question that excessive exposure to Pb results in clinical toxicity. There is uncertainty regarding the potential harmful effects of low levels of Pb that do not produce overt toxicity. (Author summary modified)

39849 **APTIC NO. 61762**

Grandjean, P. and B. Holma

A HISTORY OF LEAD RETENTION IN THE DANISH POPULATION. *Environ. Physiol. Biochem., 3(6):268-273, 1973. 15 refs.*

Atomic absorption spectrophotometry was used to determine the lead conten of human bones from the Danish population for various historical periods in order to evaluate the retention of the metal. Vertebrae from the Middle Ages had a lead content that was two to ten times thy natural level in accordance with the usage of lead-containing materials in this period. A lead concentration of more than 20 times the natural level (median: 6.8 micrograms/g dry weight) was found in bones from Copenhagen people who died during the plague in 1971, indicating an increased lead intake at that time. A positive correlation was found between the lead concentration in bones and the concentration in the earth in which the bones were buried, although the correlation could not be explained by exchange of lead between bones and earth. The lead content of 13 vertebrae from the 1940 s was high, whereas the lead concentration in bone samples from individuals who had died suddenly and were aged more than 14 years in 1972 was only about five times greater than the natural level (median: 1.4 micrograms/g dry weight).

39850 **APTIC NO. 62697**

Hackney, Jack D.

SMOKING AND CHRONIC AIRWAYS OBSTRUCTION: THE INDIVIDUAL AND COMBINED EFFECTS OF SMOKING AND OTHER ATMOSPHERIC POLLU-

TANTS IN CHRONIC AIRWAYS OBSTRUCTION (ANNUTAL PROGRESS REPORT). *Attending Staff Assoc. of the Rancho Los Amigos Hospital, Downey, Calif., National Heart and Lung Institute Contract No1-HR3-2901, No1-HR3-2901-A73, 65p., Sept. 1973.*

NTIS: PB-225 569

The annual progress report on a multi-phase study of the individual and combined effects of smoking and other atmospheric pollutants in chronic airways obstruction is presented. The utility of a sensitive, reliable, and easily administered test procedure than can be applied in the conduct of population surveys was developed, implemented, and tested. An apparatus for measuring closing volumes and flow volume loops was developed and tested. Population testing was conducted in the San Francisco and Los Angeles area over both the summer and winter seasons. The summer testing is completed in the Los Angeles area and is underway in San Francisco. The entire Continental Insurance Co. s employee population in these two areas were surveyed for medical, residential, commuting, and smoking data. The research program will provide information on possible acute, sub-acute, and chronic effects of atmospheric pollutants and smoking, as well as demonstrate a general methodology that can allow these time dependent effects to be separated. (Author abstract modified)

39851 **APTIC NO. 62359**

Harada, Y., A. Yamada, and E. Tahara

MUCOSAL DISTURBANCES DUE TO EXPERIMENTAL INHALATION OF POISONOUS GASES. *(Yudoku gasu ni yoru kinenmaku no shogai). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho(J. Japan Broncho Esophagolog. Soc.), 24(5):226-227, Oct. 1973. (Presented at the XXV Annual Meeting of the Japan Bronco-Esophagological Society.)*

The airway disturbances induced by inhalation by mice of mustard gas, lucite, and sulfur dioxide were examined by electron microscopy and scanning electron microscopy. The ICR mice were exposed to 200 ppm SO2 for 10 min and 2 mg/l mustard gas and lucite for 10 min. In the mice exposed to SO2, although there was some falling out of cilia and reduction of ciliated cells, the basal body was well preserved with only a few uncleared mitochondrial cristae. In nonciliated cells, however, there were large vacuoles and a thinning out of ground substances. In the mice exposed to mustard gas, there was conspicuous disappearance and falling out of cilia of ciliated cells with deformation and reduction of the remaining cells. Spiral shaped deformation of cilia was noticeable. There was a dense material on the surface of remaining cilia. In the mice exposed to lucite there were major disturbances in the tracheal mucosa. In the area where cilia remained their direction and rigidity were disturbed. In animals sacrificed two weeks after the exposure, regeneration of the cilia had begun, however, they had small nodes and were directionless. Some sections lacked regeneration of cilia or microvilli, suggesting strong erosion by the gases.

39852 **APTIC NO. 62077**

Ho, W. and A. Furst

LUNG CARCINOGENESIS BY BENZPYRENE INSTILLATION. *Proc. West. Pharmacol. Soc., vol. 16:146-149, 1973. 6 refs.*

The carcinogenic effects of benzo(a)pyrene (BP) administered by intratracheal instillation into 340 female NIH-Swiss mice was investigated. Less than 10% of the mice died as the result of the instillation treatment. The lethal effect was due largely to the frequency of treatment rather than to the dosage given. The quantities (0.15 mg, 0.3 mg, and 0.4 mg) of BP used in the experiment appeared to be within the animal s limit of tolerance. Both the lymphoid hyperplasia and foamy macrophages observed in the BP-treated lungs were caused by the invasion of foreign irritants. There was a neoplastic incidence 20 times the normal occurence in this strain of mice. The failure of BP to induce malignant tumors in the mice suggests several possible interpretations: the conditions of the experiment were not conducive to malignant tumor induction; the aryl hydrocarbon hydroxylase enzymatic system of NIH-Swiss mitigated tumor formation; the pulmonary anatomy of the mouse may not be suitable for carcinogenic studies; BP alone may not be suitable for carcinogenic studies; and BP alone may not be responsible for malignant tumor formation.

39853 **APTIC NO. 57735**

Kaltreider, H. Benfer

HYPERSENSITIVITY PNEUMONITIS: IMMUNOLOGICALLY MEDIATED LUNG DISEASE RESULTING FROM THE INHALATION OF ORGANIC ANTIGENS. *J. Occup. Med., 15(12):949-952, Dec. 1973. 8 refs.*

Exposure to organic dusts frequently leads to the syndrome of bronchial asthma which is easily recognized. Less well known is the syndrome of interstitial pneumonitis which occurs in certain individuals after repeated or longstanding exposure to organic antigens of fungal, bacterial, or foreign protein origin. This pulmonary disease is mediated by an intermediate-type hypersensitivity immunologic reaction (Type II) and has been called hypersensitivity pneumonitis. The etiology, immunopathogenesis, clinical features, and treatment of this important group of preventable lung diseases are discussed. Forms of hypersensitivity pneumonitis include various pneumoconioses such as Farmer s lung caused by spores in various types of plant dust. Predisposing factors, clinical syndrome, laboratory data, pulmonary function, pathology, and diagnosis of the disease are also mentioned. (Author summary modified)

39854 **APTIC NO. 62118**

Kashiwagi, H. and T. Takahashi

CHARACTERISTICS OF OBSTRUCTIVE DISEASES IN RESPIRATORY SYSTEM, CAUSED UNDER THE ENVIRONMENTAL AIR POLLUTION. *(Taiki osen kankyo-ka hassho shita heisokusei kokyuki shikkan no tokucho). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho Esophagolog. Soc.), 24(5):242, Oct. 1973. (Presented at the XXV Annual Meeting of the Japan Broncho-Esophagological Society.)*

Since 1969, 164 patients of obstructive lung disease such as asthma have been examined in Yokkaichi and the cases classified into two groups, A and B, the former being those with the illness before pollution became apparent and whose cases were aggravated by the pollution and the latter being those who became ill after the pollution became apparent. In group A the morbidity of asthma and pulmonary emphysema is high. In group B the morbidity of asthma is greater than 50%, followed by that of chronic bronchitis and some minor cases of pulmonary emphysema. The characteristic feature of group B is a minor hereditary factor and low positivity in intracutaneous reaction. The most frequent cases of asthma are an allergic kind with high values of blood histamine, serotonin, and immunoglobuline E. Chronic bronchitis and pulmonary emphysema frequently accompany asthma. Examination of 270 outpatients in 1972 revealed a preponderance of asthma, and asthmatic lineage and positive intracutaneous reaction were lower in polluted areas than in unpolluted areas. However, long-lived asthmatics became sensitized by allergens other than house dust and the acetylcholine inhalation test on healthy inhabitants of polluted and unpolluted areas showed that the former had slightly accentuated hypersensitivity of airway. When 110 asthmatics were treated in clean air rooms the symptoms associated with air pollution disappeared. Thus air pollution causes accentuation of airway hypersensitivity to asthma and sometimes causes secondary airway infection resulting in illness even in persons who have relatively lighter hereditary burdens.

39855 **APTIC NO. 61879**

Kato, H.

A REMARK ON RESPIRATORY DISEASES FROM THE STANDPOINT AS A FLEXIBLE FIBER BRONCHOSCOPIST. *(Hatsugen; furekishiburu faiba buronkosukopisuto no tachiba kara). Text in Japanese. Nihon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(12):741- 742, Dec. 1973. (Presented at the Symposium on Air Pollution and Respiratory Diseases, 2nd, at the Japanese Society of Thoracic Diseases, Annual Meeting, 13th, April 1973.)*

Bronchoscopic examinations have revealed an increase in the number of cases in which a broad range of changes in the mucous of the trachea and bronchus overlaps the ordinary findings. Investigations were made of such overlaps in cases of bronchial asthma, pulmonary fibrosis, malformation, and malignant and benign tumors. The changes were closely related to air pollution. The findings include: general hyperemia in the larynx and inflamed polyps connected anteriorly to the vocal cords, general hyperemia and a thin, clear, and viscous secreted matter on the trachea and bronchus in a man who worked for 11 years in a polluted atmosphere, general hypermia with a small clear to white granular secretion, partial submucosal hemmorrhage, and lateral wrinkles of bronchus and trachea in a patient living in an air polluted district who had a cystoma of the left upper lobe of the lung (this is compared to the ordinary findings in a patient with the same cystoma in the right middle lobe). There were many fiber scope findings of disease onset in subjects from air polluted areas.

39856 **APTIC NO. 61862**

Kyono, Y., S. Koshi, and K. Kawai

MORPHOMETRY OF MINUTE REACTION OF THE LUNG. *(Bijaku hai hanno no keitaigakuteki ken-shutsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):432, Oct. 1973. 2 refs. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Electron microscopic examinations of the morphology of cells detect anomalies with a high degree of accuracy. Edema of the alveolar wall of rat lungs was detected after inhalation of lead particles condiserably sooner than was possible with optical microscopy. Methods of preparing the conventionally extracted sample for electron microscopy are discussed.

39857 **APTIC NO. 60269**

Makino, S. and A. Miyamoto

AIR POLLUTION AND HYPERSENSITIVENESS OF AIR WAY. *(Taiki osen to kido kabinsei). Text in Japanese. Gendai Iryo (Mod. Med. Treat.), vol. 5:1264-1270, 1973. 13 refs.*

The causes of airway contraction include allergens, infection, and air pollutants such as sulfur dioxide, nitrogen dioxide, and ozone. The pollutants can change the hypersensitivity of the airway. When inhaled, they attach to the trachea and bronchus to stimulate the irritant receptor and cause reflex contraction of the airway. It is possible that pollutants can cause the symptoms of asthma, and they are known to aggravate existing asthmas. Some possible mechanisms for this are discussed.

39858 **APTIC NO. 61794**

Mikami, R.

PATHOPHYSIOLOGY OF RESPIRATORY DISEASES CONCERNING AIR POLLUTION: CLINICAL FINDINGS ON SO-CALLED PHOTOCHEMICAL SMOG. *(Byotai; iwayuru kokagaku sumoggu no rinsho). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(12):723- 736, Dec. 1973. 21 refs. (Presented at the Symposium on Air Pollution and Respiratory Diseases, 2nd, at the Japanese Society of Thoracic Diseases, Annual Meeting, 13th, April 1973, Paper 4.)*

The acute health impairments seen in the summer in Japan as well as the U. S. are reported. Professor Smith s theory of photochemical formation of secondary pollutants such as ozone, nitrogen dioxide, aldehydes, and peroxyacetyl nitrate is referred to in this regard. The terminology so-called is adopted because Japanese cases differ from those of the U. S. in the concentration of oxidant. Furthermore, Japanese cases are tabulated and their clinical findings are precisely described. Although the conditions of discovery of smog symptoms show some differences, a common pattern is found among the symptoms. Subjective and objective findings are divided into topical findings on eyes, upper and lower airways, and lung and general findings such as headache, dizziness, peripheral nerve disturbances, spasm, general malaise, nausea, chill, and pyrexia. There is a slight increase in leukocytes and bilirubin derivatives, the latter finding suggesting hemolysis by inhaled chemicals, and occasional protraction and palingenesis, suggesting retention of inhaled substances. The onset is affected by the increased inhalation of pollutants due to exercise and by personal differences in susceptibility to pollutants. Cooperation with basic science and the consideration of aerosols as well as oxidants will be necessary for the elucidation of the causes of these symptoms.

39859 **APTIC NO. 61860**

Mikami, R. and S. Kudo

AIR POLLUTION, ESPECIALLY OXIDANT AND RESPIRATORY ORGANS. *(Taiki osen - kotoni okishidanto to kokyuki). Text in Japanese. Naika, 32(5):837-844, Nov. 1973. 44 refs.*

The oxidant which is formed by photochemical reaction from nitrogen dioxide and hydrocarbons in the air is a generic name for substances which isolate iodine from neutral aqueous solutions of potassium iodide, and therefore it is not a single substance, but consists of ozone, NO2, peroxyacetyl nitrate, and several organic peroxides. Because of oxidation through chromate filters, nitric oxide is determined as NO2, and the photochemical oxidant concentration hitherto published in Japan includes NO and NO2. On the other hand, the secondary air pollutants formed by photochemical reaction in the air such as reductive aldehydes and aerosols are not determined as oxidant. The effects of each oxidant on respiratory organs are described. The site of action in the airway depends on whether the pollutant is an aerosol or a gas, and in the case of aerosols such as PAN it depends on the particle size of the aerosol, the particles smaller than two micron arriving at the bronchiole-alveoli and the larger particles adhering to the upper airway mucosa. Also, the gases differ in their target depending on their solubility in water. Water soluble sulfur dioxide is caught in the upper airway, while ozone and NO2 reach the alveoli (100%). Specific features of acute injuries due to photochemical smog in Japan are described and the diversity of pollutants secondarily formed by photochemical reactions is discussed.

39860 **APTIC NO. 62157**

Miyasaka, M.

ON THE ACTUAL CONDITIONS OF SYMPTOMS CHRONIC BRONCHITIS-LIKE, BRONCHIAL ASTHMA-LIKE AND PULMONARY EMPHYSEMA-LIKE OF PATIENTS OF TUBERCULOSIS WHO ENTER INTO SANATORIUMS IN AIR POLLUTED DISTRICT. *(Taiki osen chiiki no sanatoriumu ni nyuin suru kekkakukanja no kogaibyo ruiji no shojo (mansei kikanshien yo-shojo, kikanshi zensoku yo-shojo, haikishu yo-shojo) no jittai ni tsuite). Text in Japanese. Nihon Kyobu Rinsho (Japan. J. Chest Diseases), 32(10):726-731, Oct. 1973. 10 refs.*

Two hundred and two tuberculosis patients were studied for incidence of chronic bronchitis-like, pulmonary emphysema, and bronchial asthma-like diseases. The incidence of chronic bronchitis-like syndrome was greatest in patients with advanced tuberculosis, but the relationship to smoking or air pollution was not demonstrated. The incidence of chronic bronchitis-like syndrome was 33% in males and 37% in females. Emphysema was related to the extent of parenchymal involvement, old age, and chronic bronchitis-like syndrome. The emphysema occurred in 18.2% of the males and 31.4% of the females. The percentage of obstructive disturbances in the subjects with X-ray emphysema findings was 63% in males and 82% in females; the percentages of asthma-like syndrome in the tuberculosis patients were 24 and 32%, respectively. Most of the asthma-like syndrome patients also had chronic bronchitis-like syndrome. Some cases similar to the so- called Yokkaichi asthma were found. Subjects with chronic bronchitis-like syndrome and obstructive disturbances were large in number; their obstructive disturbance tended to increase and to be advanced if they were older than 60 years old. Subjects without chronic bronchitis-like syndrome having obstructive disturbances were few.

39861 **APTIC NO. 62105**

Murray, C. P. Francisco Vizcaino, Fidel Mascareno Sauceda, and Gregorio Martinez Narvaez

ENVIRONMENTAL CONTAMINATION AND THE HEALTH OF THE CHILD. *(La contaminacion ambiental y la salud del nino). Text in Spanish. Salud Publica Mexico, 15(1):91-100, Jan.-Feb. 1973.*

The effects of air pollution on health are reviewed, focusing on the factors which can most harm children. It is possible to identify certain agents introduced by modern technology such as the use of insecticides, corrosive substances, toxic gases, metal compounds, and chemicals as the main causes of child deaths for the following reasons: curiosity and inexperience on the part of the child, thus facilitating contact, exposure, or ingestion; and the biological nature and lesser corporal volume of the child. Children are harmed by smaller doses of toxics than adults are. The presence of foreign substances in the air from cars and industry harm exposed skin, the eyes, nose, throat, and respiratory system. Children in urban areas such as Mexico City have a higher rate of respiratory diseases than their rural counterparts. Carbon monoxide in contact with hemoglobin can form carboxyhemoglobin, effect the central nervous system, cardiorespiratory system, and cause severe types of anemia. Lead also can harm the hemoglobin and cause kidney and liver damage. Pesticides, ingested through food and water, effect children. Retention of various substances by the body varies with age: chromium, aluminum in the lungs, cadmium in the kidneys and liver, and mercury in the liver all have higher rates of retention in children. Pollutants such as DDT can also cause chronic anemias accompanied by granulocitopeny and trombocitopeny. Petroleum products and refinery residues are harmful due to carcinogenic compounds. Radiation exposure effects blood cells, intestines, skin, and the reproductive organs.

39862 **APTIC NO. 62178**

Nagano, J., Y. Sagawa, H. Yamabayashi, T. Satake, T. Yokoyama, and T. Takijima

STANDARD TECHNIQUE FOR DETECTING RESPIRATORY DISTURBANCE DUE TO AIR POLLUTION: A SPECIAL REPORT. *(Tokubetsu hokoku; Nihon kyobu shikkan gakkai hai seiri semmon iinkai Taiki osen ni yoru kokyu shogai o kenshutsu suru tameno sutandado tekuniku). Text in Japanese. Nihon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(12):747-748, Dec. 1973. (Presented at the Japan Society for Thoracic Diseases, Annual Meeting, 23rd, Symposium on Air Pollution and Respiratory Diseases, II, April 1973.)*

Standard techniques of detecting respiratory disturbances caused by air pollution are discussed. Functions that are most closely connected to respiratory disease are: spirography, measuring ventilation and vital capacity; oscillation, measuring respiratory resistance; body plethysmography, measuring airway resistance; flow-volume curve; the phenomenon of closing volume; pulmonary compliance frequency; intrapulmonary distribution of gases; and blood gas analysis. In order to choose a standard method, these parameters must be evaluated according to their adaptability to degree of pollution, susceptibility of the host, age, smoking habits, and other human variables.

39863 **APTIC NO. 61002**

Novoselov, V. I., V. Y. Kondratev, and V. I. Kuznetsov

THE EFFECT OF CADMIUM ON THE ZINC CONTENT IN THE HIPPOCAMPUS OF RATS. *(Vliyaniye in yektsiy kadmiya na soderzhaniye tsinka v gippokampe krys). Izv. Akad. Nauk. SSSR, Ser. Biol., no. 2:287-288, 1973. 8 refs. Translated from Russian, 4p.*

The effect of the intraperitoneal injection of cadmium on the zinc content in the hippocampus and neocortex of rats was studied. Two hours after the cadmium was injected, the zinc content in the hippocampus and neocortex decreased, by 20% and 8.5%, respectively. About 40% of the zinc in the r. inferior was assumed to have a rapid turnover rate.

39864 **APTIC NO. 61055**

Ohira, Masahiko and Hideyasu Aoyama

EPIDEMIOLOGICAL STUDIES ON THE MORINAGA POWDERED MILK POISONING INCIDENT: FINAL REPORT OF THE JOINT PROJECT TEAM FROM HIROSHIMA AND OKAYAMA UNIVERSITIES FOR SURVEY OF THE SENO AREA. *(Morinaga hiso miruku chudoku ni kan-suru ekigaku chosa: Seno chiku ni okeru Hirodai, Okadai godo kenshin saishu hokoku). Nihon Eiseigaku Zasshi (Japan. J. Hyg.), 27(6):500-531, Feb. 1973. 66 refs. Translated from Japanese, 94p.*

The poisoning of babies in 1955 in Japan from arsenic-tainted milk is reviewed, and a follow-up study is described. The number of victims in Feb. 1956 was 12,159, of whom 131 died. The disaster was caused by the process of manufacturing the powdered milk. Disodium phosphate was added as a stabilizer to make the milk easily soluble. This disodium phosphate was poorly purified, intended for nonfood industrial use, and contained a toxic dose of arsenic, sodium arsenite, and vanadium compounds. In a follow-up survey on victims in Okayama Prefecture between Dec. 1969 and April 1970, 214 people answered a questionnaire and 74 people were given a medical examination. A comparative study was performed on the victims and their siblings. A comparative study was also made on children in the Seno district in Hiroshima Prefecture. One hundred and twenty-four children were examined in Senogawa. The victims had a statistically significant greater number of complaints, lower intelligence, higher rate of severe retardation, retarded growth, more ailments and absenteeism, more poor school records and emotional disturbances, more myopia, more abnormal EEG findings, more tooth decay, more abnormal tooth growth, and more abnormal x-rays than the control children. The victims also had more mortality, more prevalence of abnormal ophthalmoscopic findings, more retardation of physical and skeletal growth, more peridontal disease, more narrow range of vision, and more abnormal teeth x-rays than the control groups, although not to a statistically significant degree. Thus, many victims are still suffering physical and mental disorders from drinking tainted milk 17 years ago. In spite of this, the Morinaga Company has not compensated the victims for the damage due to their powdered milk.

39865 **APTIC NO. 62374**

Okutani, Hirotoshi, Akira Harada, and Hideo Kurita

THE EFFECTS OF RESTS AT A RESORT ON LEAD VICTIM CHILDREN. *(Enosen gakudo no tenchi hoyo no koka). Text in Japanese. Nihon Eisei Zasshi (Japan. J. Hyg.), 28(1):96, April 1973.*

The schoolchildren in Nagoya who had more than 30 micrograms of blood lead/dl, living in the vicinity of a steel factory, were sent to a mountain resort during their summer vacation. The children were 8 to 16 yr old and they spent 3 weeks. Their progress was observed and the records before and after the vacation were compared. Changes in blood lead, urine lead, aminolevulinic acid, and erythrocytes were found at the end of the period, and coproporphyrine showed a tendency of decrease. Red corpuscles increased, and other blood indices showed an increase. The children's weights and grasps increased, and general health improvements were noted. The decrease of blood lead was found in 11 out of 15. The blood lead decrease and the size of arm, subcutaneous fat, weight, and chest size showed correlations. The change of environment definitely contributed much to the improvements in children's health.

39866 **APTIC NO. 62376**

Okutani, Hirotoshi and Akira Harada

THE EFFECTS OF LEAD POLLUTION ON RESIDENTS AROUND A STEEL FACTORY. *(Bo seiko kojo shuhen chiiki jumin no en osen). Text in Japanese. Nippon Eisei Zasshi (Japan J. Hyg.), 28(1):91, April 1973.*

The effects of lead dusts created by a steel plant electric furnace in Nagoya were investigated by examining 12 male, 38 female, and 61 schoolchildren during the summer of 1971. The lead level in blood, urine lead, coproporphyrine, baso erythyrocyte, hemoglobin, and suspended particulates and atmospheric lead were examined. In general, lead in the blood and urine and coproporphyrine increased. The blood lead level of children was clearly higher than that of adults. Some dark black-blue linear deposits were noted inside teeth, though no coloring had occurred on the outer surface of the teeth. Some symptoms suggesting lead poisoning were noted in some people but were not confirmed. Light cases of anemia were noted.

39867 **APTIC NO. 62177**

Oshina, T., R. Sugai, H. Sato, and K. Kaneda

RESULTS OF THE ENVIRONMENTAL POLLUTION INVESTIGATION ON FLUORIDES IN THE SURROUNDING OF AN ALUMINUM REFINERY - INVESTIGATION OF FLUORINE POLLUTION OF DIETS. *(Arumi seiren kojo shuhen no fukkabutsu no kankyo osen chosa - sesshu shokuhin no osen chosa). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10)Special Suppl.): 1p., Oct. 1973. (Presented at the Japan Society of Public Health, Annual Meeting, 32nd, Hiroshima, Japan, Oct. 1973. Paper 561.)*

By the investigation of daily diets of inhabitants of the area surrounding an aluminum refinery, the intake of fluorine was estimated to obtain the fundamental information concerning indirect effects of fluorine to human body. Differences of fluorine in urine between areas, ages, and sexes in the districts where the effects of air pollution of fluorine had been recognized were considered. The aerial content of fluorine in the neighboring zone of the refinery averaged 381 micrograms/LTP sq cm/mo from May 1972 to Feb. 1973. The ingested fluorine in the neighboring zone was 1.57-2.33 times larger than that of the control area, in the surronding zone 1.33-2.13 times larger, and both are significantly larger in adult females and children of both sexes. The fluorine content of urine in the people of the neighboring zone and the surrounding zone of the refinery were respectively, 1.29-1.92 and 1.30-2.13 times larger in the people in the control area. The ratio of fluorine in urine to retained fluorine averaged 0.635 in adults and 0.476 in children, the ratio in adults to the ratio in children being 1:0.75. There is apparently a difference of fluorine metabolism in age.

39868 **APTIC NO. 61928**

Oyagi, S.

COMPARISON OF STANDARD MORTALITY RATIOS OF LUNG AND STOMACH CANCER WITHIN USHIGOME- AND TAMAGAWA HEALTH CENTER-JURISDICTIONS CLASSIFIED INTO STREETS(SECTIONS). *(Ushigome, Tamagawa ryo hokenjo kannai ni okeru haigan oyobi igan shibo no shibo hyojunhi S.M.R. ni yoru cho-cho betsu hikaku). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10 Special Supplement): 1p., Oct. 1973. (Presented at the Japanese Society of Public Health, Annual Meeting, 32nd, Hiroshima, Oct. 1973, Paper 643.)*

In the Tokyo Metropolis in 1970 the standard mortality ratio of lung cancer was 25.1% higher than the overall value for Japan, while that for stomach cancer was only 2.8% higher. Thus, the sudden increase in lung cancer cannot be explained by smoking alone, but must be attributed to air pollution caused by increased motor traffic. The carbon monoxide concentration at Yanagicho crossing was highest in the spring and autumn of 1966 (87.5 ppm), and the mortality ratios by diseases in inhabitants living within a 200 m radius of the crossing showed peaks of pulmonary emphysema and hypertension in 1963-1965 and a peak of total cancer (especially lung cancer) in 1969. The mortality ratio and temporal accumulation of cancer was reduced with the reduction of motor traffic accompanied by that of CO. An area including Yanagicho of 40 blocks around the Ushigome Health Center and an area of 62 blocks around the Tamagawa Health Center showed accumulations of lung cancer with levels of significance of 0.2-0.7% and 3.0%, respectively. A common environmental factor between the two areas is the existence of periods of traffic jam.

39869 **APTIC NO. 62027**

Peterson, Jack E. and Richard D. Stewart

PREDICTING THE CARBOXYHEMOGLOBIN LEVELS RESULTING FROM CARBON MONOXIDE EXPOSURES. *Medical College of Wisconsin, Milwaukee, Allen-Bradley Medical Science Lab., Coordinating Research Council Air Pollution Research Advisory Committee Contract, Proj. CAPM-3-68, Rept. MCOW-ENVM-CO-73-1, 47p., June 1973. 19 refs.*

Data from a series of human exposures to carbon monoxide were analyzed to determine the fit to the theoretical Coburn, Forster, Kane (CFK) equation as a function of experiment duration and CO concentration, exercise level, and sex. The equation was predicted carboxyhemoglobin (COHb) levels for both men and women at exercise rates ranging from sedentary to 300 kp-m/min when they were exposed to steady CO concentrations of 50, 100, and 200 ppm for 0.33 to 5.25 hr. In addition, the equation accurately summed the results of a discontinuous exposure to CO. Methods for determining values of each of the variables in the CFK equation were collected and a rational, efficient procedure for solving the equation by trial and error was outlined. The CFK equation was then used to prepare a graph relating COHb saturation to exposure duration and concentration, and also to describe the effect of several variables on the rate of CO uptake and equilibrium COHb levels. (Author summary)

39870 **APTIC NO. 61852**

Sakakura, Y.

RELATION BETWEEN AIR POLLUTION AND INFECTION IN AIR WAY. *(Taiki osen to kido kansen). Text in Japanese. Nihon Kikan Shokudoka Gakka i Kaiho (J. Japan Broncho Esophagolog. Soc.), 24(5):240-241, Oct. 1973.*

Domestic fowls and rabbits exposed to open air in Yokkaichi, where sulfur dioxide concentration has been high, showed thickening of the tracheal and bronchial epithelium, partial disappearance of cilia, an increase in chalice cells, and in some animals lung disturbances such as localized atelectasis. Mice were exposed to 0.01-0.03 ppm SO2 for periods of eight weeks and the dynamic state of their tracheal epithelial cells was followed by tritiated thymidine autoradiography. After one week of exposure the labeling index showed a significant increase, but did not change further after that. After one week the characteristic tissue change was the partial falling out of epithelial cells and the proliferation of basal cells. After three weeks exposure the characteristic change was an increase in PAS-positive cells in the epithelium and a proliferation of glandular tissue beneath the epithelium. The result of inoculation of 8 week-exposed mice with influenza virus PR-8 was that the progress of inflammation was faster and the pathological change more severe with earlier falling out of epithelium than in the controls. The tracheal mucosa (which became stabilized after three weeks exposure in terms of increased PAS-positive cells and glandular tissue proliferation) showed greater pathological change from viral infection. In analyzing the pathogenesis, the decrease of nonspecific protective functions such as the change of mucociliary activity, production of interferon, and local dynamic blood flow were considered. Mucociliary activity and cilial motion were suppressed by SO2 and the network of smaller tracheal vessels became irregular with serpentine cracks.

39871 **APTIC NO. 61944**

Schlipkoeter, H.

AIR POLLUTANTS AND THEIR INFLUENCES ON THE HEALTH OF MAN. *(Luftverunreinigungen und deren Einfluesse auf die Gesundheit des Menschen). Text in German. Umwelt Aktuel., (4):3-20, 1973. 65 refs. (Presented at the Congress Umwelt 72, Stuttgart Germany, June 30-July 9, 1972.)*

Results of epidemiological studies of the effect of air pollutants from the literature and original studies are presented and the present state of knowledge of the effects of carbon monoxide and benzopyrene on man is reviewed. Comparative studies on 9 to 13 year-old children in the Ruhr area, on Sylt, in Freiburg and the Hunsrueck mountains, which are in the fourth year now, have shown that children of the Ruhr area have a retarded bone growth and are smaller than children in the non-polluted areas. In the exposed group enlarged lymph nodes were frequently found and a lower value for HbE (a hemoglobin condition in which the eletrophoretic motility is abnormally slow) could be confirmed. The sulfur dioxide concentrations in the polluted and non-polluted areas differed by about 1:6. A relationship between high air pollutant concentrations during inversion and the higher mortality and morbidity during these periods has been well established. It is more difficult to determine the effects of constant exposure to the emissions found in urban areas today. The approximate emission concentrations of major pollutants in cities of Germany are presented in a table. In the concentration range of 0.1 microgram/cu m and below, the atmosphere contains already more than 100 different pollutants.

39872 **APTIC NO. 62345**

Seiff, Henry E.

CARBON MONOXIDE AS AN INDICATOR OF CIGARETTE-CAUSED POLLUTION LEVELS IN INTERCITY BUSES (FINAL TECHNICAL REPORT). *Dept. of Transportation, Washington, D. C., Bureau of Motor Carrier Safety, Rept. BMCS-IHS-73-1, 13p., April 1973. 8 refs.*

NTIS: PB-222 973

Tests were conducted on an intercity bus to achieve worst case and realistic carbon monoxide levels by the Bureau of Motor Carrier Safety in response to increasing public concern about the safety and comfort effects of smoking on intercity buses. It was hypothesized that CO levels would give an indication of the health effect of smoke levels. Under simulated worst case conditions which are unlikely to be duplicated in actual service, CO levels were substantially below standards set by the Occupational Safety and Health Administration. However, in the worst case test four of the six experiment subjects agreed that the smoke level was irritating. In the realistic test, the CO level was 5 ppm above ambient and the accompanying smoke level was not considered to be disturbing. Regulations to limit smoking and to segregate smokers to eliminate the possibility of smoke causing discomfort to bus occupants are supported. There is no direct evidence indicating that CO from the smoking on buses in normal operation will affect the safety of operation of the vehicle. (Author abstract modified)

39873 **APTIC NO. 62285**

Shubik, Philippe and Frej Stenback

EVALUATION OF TOXICITY AND CARCINOGENICITY OF AUTOMOBILE EXHAUST CONDENSATES IN HAMSTERS. (PROGRESS REPORT). *Nebraska Univ. Medical Center, Omaha, Eppley Inst. for Research in Cancer, Coordinating Research Council Contract CAPM-5-68, 8p., Dec. 1, 1973.*

The toxicity and carcinogenicity of automobile exhaust was studied by intratracheal instillation of condensates in hamsters. Exhaust samples from a reference fuel without additives, from high polymer amines of the type known to promote engine cleanliness, and from an organometallic fuel were used. Necropsies and histological examinations were made. Microscopic examination of the tissues revealed certain changes in the respiratory system, kidneys, and liver. However, specific differences between the various samples were not observed, necrospsy revealed no abnormalities, and the hamsters exhibited normal appearance and behavior.

39874 **APTIC NO. 61819**

Takayama, O., H. Kato, E. Ishiyama, Y. Oshio, M. Seto, and T. Suzuki

PURSUIT OF OCCULT FACTORS CONCERNING THE GENERATION OF OBSTRUCTIVE RESPIRATORY DISEASES - ON UPPER AIR WAY. *(Heisokusei kokyuki shikkan no hassei ni kansuru senzai inshi no tsuikyu - jokido ni tsuite). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho J. Japan Broncho Esophagolog. Soc., 24(5):199, Oct. 1973. A lecture at XXV Ann. Meeting of Nihon Kikan Shokudo-ka Gakkai. (Presented at the XXV Annual Meeting of the Japan Broncho- Esophagological Society.)*

Cooperative studies on the generation and progress of obstructive respiratory diseases in air polluted areas have been made by internists, pediatricians, and otorhinolaryngologists. Findings on the laryngopharynx were related to those on lower airway and lung functions from the otorhinolaryngological viewpoint. Inflammatory symptoms were found more frequently in inhabitants of air polluted areas than in those of nonpolluted areas. Hoarseness was also found more frequently in polluted areas with a two-peak age distribution (in the young and in the old). Duration of ability to speak was shorter among inhabitants of polluted areas. These findings were compared to investigations of lung function.

39875 **APTIC NO. 61880**

Takemoto, K.

AIR POLLUTION AND LUNG CANCER. *(Kuki osen to haigan). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 28(6):22-29, 1973. 7 refs.*

Corrected mortality rates for human lung cancer in Japan have increased from 1.9 in 1950 to 10.5 in 1970 for men and 0.8 in 1950 to 4.2 in 1970 in women per hundred thousand of the population. The physiological functions and anatomical structures of lung cancer are described. Causes, aggravations, and ratios of lung cancer to epidermal, adenoidal, and undifferentiated cancers are discussed. The 10-20-year latent period of carcinogens in the lung poses problems for animal experimentation. Inhalation of gaseous carcinogens has not been proven to cause lung cancer. Particulates such as heavy metals and asbestos are definitely carcinogenic and occupational exposures are dangerous. Carcinogenic hydrocarbons in the air should be determined. Deposition of dust particulates that have adsorbed a carcinogen in the lung is extremely toxic. Smoking increases exposure to carcinogens such as benzo(a)pyrene.

39876 **APTIC NO. 61855**

Ueda, S.

AIR POLLUTION AND PROTECTIVE MECHANISM OF AIR WAY. *(Taiki osen to kido bogyo kiko). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho Esophagolog. Soc.), 24(5):241-242, Oct. 1973. A lecture at XXV Ann. Meeting of Nihon Kikan Shokudo-ka Gakkai.*

The lungs of mice and rabbits that had inhaled sulfur dioxide, ozone, and iron particles at various concentrations and for various lengths of time were examined to determine histologically the deviations from normal states of airway protection. In the early stages the main effects are on the secreting epithelium. Hyperplasia of various epithelial systems occurs. Cilial epithelium begins to secrete. There is a shortening, diminution, and disappearance of cilia. All of these effects appear at a time corresponding to the administration of the stimulating agents. After the detoxication, dilution, and excretion, even the nonsecreting cells are mobilized, followed by the beginning of atrophy and a decrease of physical excreting capacity. Increased duration and strength of the stimulation cause the epithelial system to become nonciliated or to enter a state of cellular necrosis (juvenile cells) to be repaired by regeneration. In the alveoli, the A and B types of epithelium dedifferentiate to juvenile cells. The primary cellular disturbance from air pollution progresses to indirect disturbances resulting in chronic lesion and ending in the destruction of the airway protective system.

39877 **APTIC NO. 61878**

Yokoyama, T.

DETECTION OF RESPIRATORY FUNCTIONAL DISTURBANCE DUE TO AIR POLLUTION. *(Hatsugen; taiki osen ni yoru kokyu kino shogai no kensaku). Text in Japanese. Nippon Kyobu Shikken Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(12):742-743, Dec. 1973. (Presented at the II Symposium on Air Pollution and Respiratory Diseases at the XIII Annual Meeting of the Japanese Society of Thorack Diseases, April 1973.)*

There are some respiratory function disorders caused by air pollution which are not detectable by spirometry. Examinations of gases in arterial blood have been run parallel to determinations of respiratory resistance and analysis of air flow volume and air flow curve. The results are based on 158 cases of bronchitis diagnosed by chest examination and roentgenography and including those with peripheral pathological change such as bronchiolitis. In cases of bronchitis with abnormally lowered ventilation/sec an abnormal depression of partial pressure of oxygen in arterial blood was observed. In cases where the ventilation/sec was greater than 70% there were also cases of such a depression, however the partial pressure of carbon dioxide was in the normal range. Although anomalous partial pressure of gases in arterial blood does not necessarily indicate a disturbance of the gas exchange function of the lungs, an analysis was made of the hypoxemia of the bronchitis cases by measuring the difference between alveolar air and blood air (AaDo2 and AaDn2). In cases when ventilation/sec was abnormally low, AaDo2 was highly increased, and when ventilation/sec was greater than 70%, about half of the cases showed the same tendency. There are many cases of abnormal AaD, however, that are not accompanied by anomalous findings by spirometry.

39878 **APTIC NO. 61728**

World Health Organization, International Agency for Research on Cancer Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man

ALDRIN. *In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Organochlorine Pesticides, Vol. 5, 1973, p. 25-38. 65 refs.*

An overall view of the insecticide aldrin is presented, including chemical and physical data; production, use, occurrence, and analysis; and the biological effects. Aldrin is the common name approved by the International Standards Organization for the product containing not less than 95% of 1,2,3,4,10,10-hexachloro- 1,4,4a,8,8a hexahydro-exo-1,4-endo-5,8-dimethanonaphthalene. During an extensive monitoring of the ambient air, aldrin could be detected in only one of 875 samples taken in nine localities of the U. S. at a level of 8 ng/cu m. In a small number of samples in agricultural communities, concentrations ranged from 0.1-4 ng/cu m. Aldrin is readily converted into dieldrin in plants and animals; as a consequence it is rarely found as such in food. An epidemiological study which was carried out on occupationally exposed workers does not allow any conclusions to be drawn concerning the existence of an excess risk of developing cancer.

39879 **APTIC NO. 61729**

World Health Organization, International Agency for Research on Cancer Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man

HEPTACHLOR. *In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Organochlorine Pesticides, Vol. 5, 1973, p. 173-191. 96 refs.*

An overall view of the insecticide heptachlor is presented, including chemical and physical data; production, use, occurrence, and analysis; and the biological effects. Heptachlor is the common name approved by the International Standards Organization for 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methano- indene. During an extensive program in which the ambient air in various parts of the United States was monitored, heptachlor could be detected in only two out of nine localities at maximum levels of 19.2 and 2.3 ng/cu m, while no heptachlor epoxide was found in any of the samples. Concentrations of 0.04 ppm heptachlor epoxide were found in dust samples. Heptachlor and/or its epoxide accumulate in body fat, the epoxide being more persistent than the parent compound. In the U. S., the average total daily intake of heptachlor from food ranged from 0.003 micrograms/kg bw/day in 1965 to 0.0001 microgram/kg bw/day in 1970, with a 2-year average of 0.001 microgram/kg bw/day. There are no conclusive results on animal data and heptocarcinogenicity. Human patients with cancer did not show higher concentrations of heptachlor epoxide in fat tissues and liver than did control patients.

39880 **APTIC NO. 61730**

World Health Organization, International Agency for Research on Cancer Working Group in the Evaluation of the Carcinogenic Risk of Chemicals to Man

ENDRIN. *In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Organochlorine Pesticides, Vol. 5, 1973, p. 157-171. 68 refs.*

An overall view of the insecticide endrin is presented, including chemical and physical data; production, use, occurrence, and analysis; and the biological effects. Endrin is the common name approved by the International Standards Organization for 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro- exo-1,4-exo-5,8-dimethanonaphthalene. Endrin could be detected in only one out of nine localities in various sections of the U. S., the maximum level was 58.5 ng/cu m. During cropland spraying, concentrations in air ranged from trace amounts to 7.0 mg/cu m. Potential dermal exposure during orchard spraying ranged from 2.5-3 mg/hr, and for respiratory exposure the amount reached 0.01 mg/hr. An epidemiological study carried out on occupationally exposed workers does not allow any conclusions to be made concerning the existence of an excess risk of developing cancer.

39881 **APTIC NO. 62047**

Lawrence Radiation Lab., Berkeley, Calif., Environmental Instrumentation Group

METALS. *In: Instrumentation for Environmental Monitoring. Biomedical. Volume 4. National Science Foundation Contract, Rept. LBL-1, 185p., Dec. 15, 1973. 196 refs.*

Instruments are described for biomedical measurements. This section describes parameters which affect humans, animals, and plant life arising from environmental problems. Biomedical problems arising from air and water are discussed. Methods are described for detecting mercury, cadmium, and lead in biological samples. Atomic spectrometry, molecular absorption spectroscopy, X-ray fluorescence, neutron activation analysis, and other methods are reviewed. Sampling and sample handling, methods of analysis, instrument calibration, and analytical techniques for arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, and other metals are described. Sources, physical and chemical properties, chemical forms, metabolism, routes of exposure through food chains, and genetic effects of mercury are reviewed. Properties, absorption, intake, retention, toxicity, mechanisms of biological action, carcinogenicity, mutagenicity, teratogenicity, and standards of cadmium are described. Sources, physical and chemical properties, transformation, intake, retention, distribution, metabolism, and effects of lead are reviewed. Principle of operation, applications, and instrument comparisons are given for atomic absorption spectrophotometry.

39882 **APTIC NO. 62101**

IMPACTS OF AIR POLLUTION ON MAN. *(Auswirkungen der Luftverunreinigung auf den Menschen). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:318-324, Dec. 1973.*

The acute and chronic action of air pollution on the human organism is outlined on the basis of morbidity and mortality figures obtained in epidemiological studies. Correlations between mortality and air pollution exist only for high pollutant levels as occur in emergency situations. Positive correlations between the respirable dust concentration in urban air and mortality, and between respirable dust level and mortality due to chronic respiratory diseases were found in a study conducted in Buffalo in an age group of 50-69 yr. Another study in Nashville revealed correlation between air pollution in general and respirable dust levels in particular, and the incidence of different forms of cancer except for lung cancer, as well as mortality due to flue, pneumonia, and tuberculosis. Increased incidence of cough and asthmatic attacks among patients in a hospital during periods of exceptionally high sulfur dioxide concentrations was observed. Subjects exposed to elevated background levels of air pollution are especially susceptible to high concentrations in emergency periods. Chronic bronchitis and cancer are supposed to be the sequelae of prolonged exposure to polluted air. Correlation between bronchitic symptoms and lung function and air pollution was determined prominently in the age group of 50-59 yr. Also, increased incidence of infections of the lower respiratory organs and air pollution was evidenced. The respiratory diseases occurring in polluted areas are mainly due to the combined effect of SO2 and soot. Increased mortality due to lung cancer in city dwellers than in country people was noted.

39883 **APTIC NO. 62191**

World Health Organization, International Agency for Research on Cancer Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man

BHC (TECHNICAL GRADES) AND LINDANE. *In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Organochlorine Pesticides, Vol. 5, 1973, p. 47-74. 131 refs.*

An overall view of the insecticides BHC and lindane is presented including chemical and physical data; production, use, occurrence, and analysis; and the biological effects. The common name BHC approved by the International Standards Organization for the mixed isomers of 1,2,3,4,5,6-hexachlorocyclohexane, while lindane is the gamma isomer of the compound. Occupational exposure during forest spraying can total the mean concentration of BHC in the air ranging from 3.2-48.4 mg/cu m and dermal exposure from 0.03-0.06 mg/sq cm/hr, depending on the location of sampling. During cropland spraying concentrations in the air ranged from 0.1-2 mg/cu m. In nine localities in various parts of the U. S. average concentrations ranged from 0.4-1.4 ng/cu m for lindane and from 0.7-5.0 ng/cu m for alpha-BHC. Maximum levels were 2.2 ng/cu m (beta-BHC), 7.0 ng/cu m (lindane) and 9.9 ng/cu m (alpha-BHC and omega-BHC). In urban air in Japan 54 ng/cu m have been detected, and very small quantities (1 g alpha-BHC/10 to the 12th power g air and 5 g lindane/10 to the 12th power g air) have been found in London and suburbs. In rainwater, average concentrations of 23 ng/l for alpha-BHC and 5-100 ng/l for lindane have been found. No definite conclusions can be drawn regarding effects on humans. Patients dying with cancer did not show higher concentrations of BHC in fat tissues and liver that did control patients. No firm conclusions as to a causal relationship with aplastic anemia and/or leukemia can be drawn from available case reports.

39884 **APTIC NO. 62272**

World Health Organization, International Agency for Research on Cancer Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man

DDT AND ASSOCIATED SUBSTANCES. *In: IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man: Some Organochlorine Pesticides, Vol. 5, 1973, p. 83-124. 192 refs.*

An overall view of the insecticide DDT and associated substances is presented, including chemical and physical data; production, use, occurrence, and analysis; and the biological effects. The common name DDT is approved by the International Standards Organization for the technical products of which, 1,1,1-trichloro- 2,2-di(4-chlorophenyl)ethane (p,p prime-DDT) is the predominant component. The concentration of DDT in air varies according to the locality and the season. In general, the concentration is lower in urban than in agricultural areas, with higher levels found during the summer, and highest levels when pesticide spraying is done. There is no apparent correlation of level with rainfall, but after several days of rain the level usually decreases. In nine locations in the U. S. concentrations of DDT ranged from 0.1 ng/cu m to as high as 1.56 micrograms/cu m. The average concentrations found in rainwater range from 3 ng p,p prime-DDT/l to 187 ng/l DDT. A cross section epidemiological study on workers exposed to DDT and the observational study on volunteers were too limited and/or too short to allow any conclusions to be made regarding carcinogenesis. Although fat concentrations of DDT residues were higher in terminal cancer patients than in control patients, this finding is inconclusive as to a causal relationship.

1972

39885 **APTIC NO. 62705**

Abdelnour, J.

BIOLOGICAL UPTAKE AND DISTRIBUTION OF LEAD IN ANIMALS. Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 55-59. 7 refs. (Oct. 31-Nov. 2.)

A model is described to predict the uptake, accumulation, and distribution of heavy metals and other contaminants in living organisms. The model is a multi-compartment, first order linear model used to study the uptake, retention, and elimination of heavy metals, especially lead, by animals. The model assumes the contaminant is transferred via the blood. The uptake and elimination follow a first order law. This implies that the instantaneous transfer rate from any given organ is directly proportional to the amount present in the organ. Mass equilibrium is satisfied at any given organ, and for the body as a whole. A schematic diagram of the physical flow of lead within the body is given. A conceptual or compartmental model, and a mathematical model describing the uptake and elimination of lead, as derived from the conceptual model, given by a set of first order linear differential equations with constant parameters, are given. An experiment on rats was devised to be used to validate the model and to determine the rate constants of the model. The preliminary results from the model look promising.

39886 **APTIC NO. 61064**

Akekseyeva, O. G. and Y. V. Vasilyeva

THE IMMUNOPATHOLOGICAL CONCEPT OF BERYLLIOSIS PATHOGENESIS. *(Immunopatologicheskaya kontseptsiya patogeneza berillioza). Gigiena Truda Prof. i Zabolevaniya, 16(5):23-26, May 1972. 28 refs. Translated from Russian, 8p.*

Experimental investigations and the literature are reviewed with regard to the immunopathological concept of berylliosis pathogenesis. Berylliosis is a disease which combines the features of pneumosclerosis, marked allergy to beryllium, peculiarities of the autoimmune processes, and possibly, signs of chemical carcinogenesis. The autoimmune and exogenous allergic reactions are closely interwoven in the pathogenesis. Strictly specific skin reactions to hapten, the appearance of complex antigens in the lungs and other tissues, and induction of antibodies, both against the beryllium-containing determinant and of autoantibodies, including those against DNA and RNA, are characteristic of berylliosis. The autoimmune nature of the process explains the systemic character of the lesion, the undulating course, and the effect of glucocorticoid therapy. Predisposition to the development of autoimmune processes contributes to the development of the granulomatous form of the disease and to shortening of the latent period, and it explains the inverse relationship between the duration of the latent period and the severity of the process. In the absence of the inducing factors, beryllium allergization develops at a slow pace, with the autoimmune process being either absent altogether or insignificant. The latent period is prolonged in this case, and a slowly progressing interstitial form of the disease develops.

39887 **APTIC NO. 61031**

Bezrodnykh, A. A., T. A. Kochetkova, T. A. Oganesyan, and N. V. Sidorova

DISTINCTIVE FEATURES OF HISTAMINE METABOLISM IN SILICOSIS. *(K osobennostyam obmena gistamina pri silikoze). Sov. Med., vol. 35:17-21, 1972. 18 refs. Translated from Russian, 12p.*

Histamine has a significant role in the genesis of the formation of connective tissues in the lungs in silicosis. Some of the characteristic, distinctive features of shifts in the synthesis and deactivation of histamine in silicosis were studied experimentally and compared with clinical laboratory data. The content of histamine in the blood of persons suffering from silicosis, berylliosis, bronchial asthma, and chronic dust-induced bronchitis was measured. In the cases of silicosis and the other diseases, a number of the indices reflecting histamine metabolism were subject to substantial variations. A sharp increase in active histamine was noted with the formation of massive fibrous fields as well as in lung pathology with definite hyperergic reactions. The increase in histamine in silicosis took place parallel with the progression of the siliocotic process. Histamines increased during asthma attacks in those suffering from bronchial asthma. Fifty-nine male rats were injected with quartz to obtain experimental silicosis. Histamine content increased as the rats silicosis increased during the first month; in the third and sixth months there was a decrease in histamine content, probably due to inhibition of its synthesis and the intensity of the deactivation processes. The release of histamine evidently played a major role in the buildup of substantial quantities of active histamine in the blood of the diseased humans and in the blood and lung tissue of the rats. The process involved in the new growth of histamine directly from the amino acid, from the histidine, was of relatively little importance. The inadequacy of the oxidation deamination of the histamine (with reduction in the activity of the histaminase reflecting this process) was relatively infrequent, putting in an appearance mainly in the severe forms of silicosis and bronchial asthma.

39888 **APTIC NO. 61021**

Clark, R. and G. Kunitsch

STATISTICAL STUDY OF THE CROSS-ALLERGY PROBLEM IN METAL SALTS. *(Statistische Untersuchung zur Frage der Kruezallergie bei Metallsalzen). Berufsdermatosen Aulendorf, 20(5):222-238, 1972. 19 refs. Translated from German, 24p.*

Statistical studies on occupation and age class distribution were performed on 500 persons allergic to metal salts who were observed as in-patients at the Linden Dermatologic Clinic, Hanover, from 1956 to 1963. The intent was to determine whether cross-allergies occur with certain metal salts (potassium dichromate, chromium(III) chloride), nickel sulfate, mercury (sublimate), mercury (precipitate), and cobalt(II) chloride). Study of the age class distribution, which showed significant differences in the times of occurrence of the morbidity maxima, showed that no cross- allergies occur with the metal salts studied. The statistical testing of hee occurrence of allergies to two metal salts gave positive correlations in eight of 11 metal salt pairs. This result cannot be considered an unambiguous indication of cross-allergy as the cause of the frequency, however. Rather, an expansion of the allergic spectrum for double allergies must be accepted. There were indications of an age component in the occurrence of metal salt allergies both in the fact that the allergies occurred more frequently at older ages and in the highe proportion of pensioners in the total set. The influence of occupation on the appearance of metal salt allergy could be shown with a reliability of 99%. No noticeably increased allergization by certain metal salts could be found in specific occupations.

39889 **APTIC NO. 62054**

Coffin, David L.

INTERACTION OF INFECTIOUS DISEASE AND AIR POLLUTANTS: INFLUENCE OF TOLERANCE. *In: Environmental Factors in Respiratory Disease. Douglas H. K. Lee (ed.), New York, Academic Press, 1972, Chapt. 11, p. 151-173. 45 refs.*

The relationship between infectious disease and air pollutants is reviewed including the influence of tolerance. Experiments conducted to determine the threshold for the ozone effect indicate that enhancement of mortality from streptococcus infection results from exposure to as little as 0.08 ppm O3 for 3 hr. The effects of nitrogen dioxide on animals increase with time. When aerosols of infectious bacteria were applied to animals which had been exposed continuously or intermittently to NO2 for 3 mo or longer, mortality differences were noted at concentrations as low as 0.5 ppm. The oxidant air pollutants, O3, NO2, and synthetic auto smog probably impose somewhat similar immediate effects in depressing the pulmonary defense to infectious agents. Ozone and to a lesser extent, NO2, reduces the number of alveolar macrophages obtainable by pulmonary lavage. Tolerance or protection develops when a normally lethal dose is preceded by a period of hours or days by a smaller sensitizer or initiating dose. The phenomenon has relevance to air pollution control, since, if it were operant in human beings, it would confer protection against oxidant air pollutants. When tolerance is investigated by means of interaction of pollutants with bacterial infection of the lung, it fails to effectively block the enhancing effect of the gas, even though some protection is evident at the higher levels of exposure studied. The effect of tolerance to O3 on the other intrapulmonary defense parameters appears to be nonexistent.

39890 **APTIC NO. 62043**

Dutu, S., G. Buneetianu, and Zoica Jienescu

EPIDEMIOLOGIC STUDY OF CHRONIC OBSTRUCTIVE BRONCHOPNEUMOPATHY WITHIN A DISTRICT OF THE TOWN OF BUCHAREST. *(Studiu epidemiologic al bronhopneumopatiei obstructive cronice intr-un teritoriu al orasului Bucuresti). Text in Romanian. Ftiziologia, 21(3):261- 282, 1972. 35 refs.*

The epidemiology of chronic obstructive bronchopneumopathy (COBP) was investigated in 1804 men and women over 40 yr of age belonging to the same medical district in Bucharest. A questionnaire was completed for each subject concerning the respiratory symptoms and the results of the ventilation function tests. There were cases of COBP in 27% of the males and 13.9% of the females and twice as frequently in smokers as in nonsmokers. The prevalence increased with the number of cigarettes smoked. Only in the case of male smokers did age play a factor and cause an increase. In nonsmokers, the proportion of COBP does not significantly differ according to the sexes, while in the case of smokers, COBP is more prevalent in the male. Harmful occupational respiratory factors appear to increase the incidence of COBP among the nonsmokers. In women smokers these factors increase the prevalence of the disease. The ventilation parameters tested were altered in 63% of the male smokers and 47.3% of the nonsmokers, and correspondingly in women, in 43.3% and 29.5%, respectively. Obstructive disorders were encountered in 37% of the males and 45% of the females. (Author summary modified)

39891 **APTIC NO. 62072**

Elo, Risto, Kari Maatta, Erkki Uksila, and Antti U. Arstila

PULMONARY DEPOSITS OF TITANIUM DIOXIDE IN MAN. *Arch. Pathol., 94(5):417-424, 1972. 14 refs.*

Titanium dioxide s industrial use has markedly increased in recent years; however, titanium s biological effects are undetermined. Lung specimens from three factory workers employed in processing titanium dioxide pigments were analyzed by qualitative X-ray fluorescence spectrometry and quantitative optic emission spectrography. Significantly higher titanium levels were found in these patients, compared to lung specimens from a general autopsy population. By light microscopy, titanium is birefringent and distinguishable from carbon. Deposits in pulmonary interstitium were associated with cell destruction and slight fibrosis. Titanium dioxide was found in lymphatics, suggesting its clearance via the lymphatic system. Electron microscopic studies revealed titanium dioxide particles within lysosomes of alveolar macrophages. These changes suggest that industrially processed titanium dioxide, either alone or with other compounds such as silica, behaves as a mild irritant in pulmonary interstitium. The irritation mechanism remains unknown. (Author abstract)

39892 **APTIC NO. 61645**

Fassett, D. W.

CADMIUM. *In: Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 4, p. 97-124. 74 refs.*

The relationship between cadmium and human health is discussed. The acute effects of oral ingestion in man are those of immediate nausea and vomiting which can occur from as little as 15 mg of total Cd. There have been considerable numbers of epidemics of acute nausea following the attempts to use Cd-plated articles as food containers. Nonfatal acute pneumonitis has been observed during silver soldering from intermittent exposure to Cd fume concentrations of from 0.5-2.5 mg/cu m over a 3-day period. Chronic exposure produces a rather characteristic emphysema which is often unaccompanied by previous history of chronic bronchitis or coughing. Such emphysema may be extremely disabling and may progress even after exposure has ceased.

39893 **APTIC NO. 61962**

Ferris, Benjamin G.

SOME SPECIFIC EFFECTS OF ENVIRONMENTAL AGENTS. *In: Fogarty International Center Proceedings No. 11: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.), New York, Academic, 1972. Chapt. 8, p. 109-118. 34 refs.*

Some specific effects of air pollutants on human health are discussed. Asthmatic attacks or bronchial constriction can be triggered by inhaling a wide variety of irritant gases as sulfur dioxide, smog, cigarette smoke, or inert dust, although the mechanism of action is not clear. An increased frequency of lower respiratory tract disease has been reported to be associated with increasing levels of SO2 in the ambient air, but apparently not with other pollutants. Poor lung clearance may lead to an accumulation of mucus, bacteria, or particulates in the lung. This could result in the symptoms of chronic bronchitis and eventual lung damage. In some exposures, as to cotton dust, histamine is released in the lung. This produces construction of the alveolar ducts and respiratory bronchioles. In vitro studies indicate that alveolar macrophages are sensitive to SO2, oxides of nitrogen, and ozone. Ozone was particularly toxic at 0.06-0.09 ppm. These are levels of ozone that are common in Los Angeles. Some components of air pollution from coal burning sources can enhance the growth of H. influenzae in cultures. There is little evidence that oxidant causes chronic bronchitis, despite the obvious irritating quality of the pollution to the mucous membranes of the eye, nose, and throat.

39894 **APTIC NO. 61684**

Goldwater, L. J. and T. W. Clarkson

MERCURY. *In: Metallic Contaminants and Human Health. Douglas H. K. Lee (ed.), New York Academic, 1972, Chapt. 2, p. 17-55. 123 refs.*

The relationship between mercury and human health is reviewed. It is assumed that Hg is present everywhere in the atmosphere as a result of its relatively high vapor pressure at ordinary temperatures and the operation of the Hg cycle. The metal may be present in the form of its vapor or as suspended particles (aerosols) of its compounds. All forms of Hg are capable of being converted to aerosols and thus may remain suspended in the atmosphere for indefinite periods of time. The discharge of Hg vapor or of Hg containing dust into the atmosphere has been primarily a problem of industrial hygiene. Mercury contamination of the general atmosphere has neither demanded nor received any major attention. The pattern of deposition of Hg is an important consideration in the toxicology of this metal. Both organic and inorganic Hg compounds if present at a sufficient concentration, will poison any cell with which they come in contact.

39895 **APTIC NO. 61639**

Goyer, Robert A. and J. Julian Chisolm

LEAD. *In: Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 3, p. 57-95. 92 refs.*

The lead content of air is discussed in a review on the relationship between lead and human health. In occupational situations where Pb or Pb-containing products are processed, Pb may be found in significant quantities in the air, or be distributed on clothing or skin, and thus gain access to the body. Concentrations of Pb in the air of industrial plants may reach 50 mg/cu m, but good industrial hygiene can reduce this source of contamination and absorption to an acceptable minimum. Effluents from smokestacks and other gaseous emissions from smelters and refining processes can distribute very significant quantities of Pb as vapor, mist, or dust to the air and the surrounding soil, where it can reach man through the ingestion of food or water. The most common source of Pb contamination in ambient air is automobile exhaust. From 70-80% of the Pb in gasoline is eventually discharged into the atmosphere. Concentrations range from 1-3 micrograms/cu m in average urban air to 40 micrograms near heavy traffic. From 25-40% of the inhaled Pb is retained in the body, the contribution from it is of the same order as that from food.

39896 **APTIC NO. 62276**

Hammond, P. B.

BIOLOGICAL EFFECTS. *Environ. Res., 5(3):312-338, Sept. 1972.*

The absorption, distribution, accumulation, loss, lethal effects, toxicity, pathological findings, chronic and other effects, toxic interactions, effects on animal and human populations, and the role of trace contaminants in toxicity are described for polychlorinated biphenyls (PCBs). Characterization of the biological fate and effects of PCBs has been hindered because the commercially prepared Aroclors used in experimental studies are mixtures of isomers which can vary in proportion between batches and manufacturers. The toxicological characterization of PCBs is further confounded by the occurrence of toxicologically significant traces of chlorinated dibenzofurans in some preparations. The distribution of body burdens of PCBs are known. Being nonpolar they are concentrated in fatty tissue and they tend to be persistent. Persistence within the body increases with degree of chlorination of different isomers in mammals and other vertebrates. The relative importance of metabolic degradation and of excretion in the clearance of PCBs from the body is not known. There is evidence that metabolic degration does play a significant role. Deaths from exposure, either acute or chronic, have not been clearly documented for man. The PCBs do not have a high acute toxicity. In rats, the lethal dose 50 is 5-10 g/kg. However, chronic intake of small doses can have adverse effects in man and other vertebrates. In man, as little as 10 mg/kg over 50 days causes chloracne. Toxic effects during continuous exposure at low levels may only appear after extremely prolonged intake. The toxic effects of PCB to man, birds, rats, dogs, and other animals are described. Great variations in species sensitivity of PCBs are evident in mammals, birds, and fish. Animals at the top of the terrestrial and aquatic food chains have the highest concentrations of PCBs. (Author summary modified)

39897 **APTIC NO. 62100**

Hayes, W. J., Jr., R. A. Neal, and H. H. Sandstead

ROLE OF BODY STORES IN ENVIRONMENTALLY INDUCED DISEASE--DDT AND LEAD. *In: Multiple Factors in the Causation of Environmentally Induced Disease. D. H. K. Lee and P. Kotin (eds.), New York, Academic, 1972, Chapt. 10, p. 135-164. 138 refs.*

The bodily storage of DDT and lead in man and their toxic effects are discussed. The storage of DDT occurs at the lowest measurable levels of intake. Slight induction of liver microsomal enzymes without detectable clinical effect occurs in men with heavy occupational exposure to DDT. These same workers have not shown other effects of DDT or its analogs whether on the nervous system, the adrenal, the liver, or reproduction. Cases of accidental ingestion make it clear that doses sufficiently higher than those received by workers in a DDT factory will produce typical, acute, neurological poisoning. Clinical cases suggest that man is immune to the adrenal atrophy caused by o, p prime-DDT in the dog. People are unlikely to experience other effects of DDT because of the large dosages required to produce them and, in some instances, because of species insusceptibility. The difference in storage of DDT and its analogs among different groups of people depends on exposure. Dosage is of predominant importance in determining not only storage but all other effects of DDT. Lead is present in the environment both as a natural constituent and as a pollutant. Under steady state conditions, more than 90% of the Pb in the body is in the skeleton and considered non-toxic. The accumulation of Pb in the soft tissues where it inhibits crucial enzymes is responsible for the toxic effects of Pb. Greatest concentrations are found in the liver, aorta, and kidney with lesser amounts in the muscle and brain.

39898 **APTIC NO. 61030**

Hintenberger, Karl

STUDIES AND PROTECTIVE MEASURES: CRITIQUE OF THE ARTICLE REFINED ALLOYS IN ISSUE 8/72. *(Untersuchungen und Schutzmassnahmen: Stellungnahme zum Artikel Aufbrennlegierungen in Heft 8/72). Dent.-Lab. (Muench), vol. 20:42, 44, 45, Oct. 18, 1972. 3 refs. Translated from German, 11p.*

A critique is given of an article on dental alloys in which the use of alloys containing beryllium was condemned due to the fact that they are dangerous to dental technicians who are making prosthetic devices in the laboratory. Data is presented to refute this premise. The assumptions were based on excessive caution. With properly equipped and ventilated laboratory facilities, little or no damage to the health of technicians working there is expected. The effects of chromium and nickel in dental alloys should be considered in addition to beryllium. The dusts and vapors of these metals are also toxic, and they also should be removed by ventilation. Various experiments and studies on the effects of beryllium alloys are reviewed to prove that their danger to dental technicians is minimal.

39899 **APTIC NO. 61646**

Hodge, Harold C. and Frank A. Smith

FLUORIDES. *In: Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 7, p. 163-187. 31 refs.*

In an overall review of fluorides, the health hazards and airborne distribution of the compounds are discussed. The literature reports the concentrations of airborne fluoride in individual samples range from traces to maximal values of approximately 8 mg/cu m, averages range from 012 to 3.4 mg/cu m. Urinary fluoride excretions range from 1-5 mg/11. Analyses of the ambient atmospheres normally present over a number of U. S. cities show fluoride concentrations ranging between 0.01 microgram/cu m and 3.9 micrograms/cu m. Fluoride absorption has not been measured, but assuming a volume of 20 cu m is inhaled per 24 hr with 100% retention, the maximal dose would be 0.004-0.04 mg daily. In a heavily polluted area, the intake of the average man would be about 0.04 mg. Such amounts constitute negligible contributions to the total daily intake of fluoride from food and water, about 0.5-1.5 mg.

39900 ***APTIC NO. 61635***

Horton, R. J. M.

EPIDEMIC ASTHMA. In: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 14, p. 219-228. 47 refs.

The relationship between epidemic asthma and air pollution is discussed. Although bronchial asthma is not usually an epidemic disease, situations do occur in which numerous asthmatics have attacks simultaneously or nearly so in a limited area and time. The most conspicuous and well defined of such phenomena are associated with repeated exposure to air pollution by allergenic vegetable dusts from industrial sources. Other causes of episodes have been air pollution with irritant gases and sharp decreases in temperature. Combinations of all or several of these stresses may also be responsible. Outbreaks of wheezing in asthmatic bronchitis may also be induced by increased air pollution. They may resemble epidemic asthma in some respects.

39901 **APTIC NO. 61040**

Isono, Naohide and Kunitatsu Fujiwara

ENVIRONMENTAL POLLUTION BY PCB (POLYCHLORINATED BIPHENYLS). II. TOXICITIES. *(PCB ni yoru osen. II. Seitai ni taisuru dokusei). Kagaku (Science), 45(6):396-406, June 1972. 105 refs. Translated from Japanese, 34p.*

The history of polychlorinated biphenyls (PCB) as an industrial disease is reviewed. From Feb. to March 1968, over one million chickens in Japan were poisoned by PCB in chicken feed. Approximately half died; in those that survived the egg production decreased. Around the same time, people were stricken with a skin disorder which was also due to PCB. The cause of both these poisonings was PCB in Kanemi rice oil which was used in the chicken feed and as a human food. The symptoms, blood test results, and treatment of the humans affected are described. Most Japanese contain more than 1 ppm PCB, which is a greater level than in the U. S. Studies are reviewed of the amount of PCB in body fat, milk, and various animals. The accumulation and elimination of PCB has been studied in many animal experiments which are reviewed. Lethal effects of PCB on various animals are mentioned. Chronic dosages of PCB can cause enzymatic degradation of chemicals in the liver. Other nonlethal effects include reduced resistance to illnesses, porphyrin disorders in birds and rabbits, impedence of various enzymes, abnormalities in fat metabolism, and toxic effects on plants. Various impurities in the PCB can effect the toxicity. The transfer of PCB from packaging materials to food has caused the U. S. to establish 5 ppm PCB as the maximum permissible standard for packaging materials. In Japan, 0.03 and 0.01 ppm PCB were detected in mothers milk and 0.3-1.9 ppm were detected in human fat systems.

39902 **APTIC NO. 62828**

Just, J.

STATE INSTITUTE OF HYGIENE (PZH) STUDIES ON HYGIENE AND ATMOSPHERIC AIR PROTECTION. *(Prace panstwowego zakladu higieny w dziedzinie higieny i ochrony powietrza atmosferycznego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(5-31):1-8, 1972. 19 refs.*

NTIS: TT 72-54023/5

Research activities and findings of the State Department of Hygiene in Warsaw are presented. Topics covered include: measurement methods for airborne dusts and atmospheric gases, experiments involving animal exposure to air pollutants, and parallel testing of the state of health of selected human populations exposed to air pollutants under various weather conditions. Two research projects in particular involve a test of the relationship between atmospheric air pollution and nonspecific ailments of the respiratory system among the inhabitants of the city of Cracow and a test of the relationship between benzo(a)pyrene concentration in the atmosphere of nine towns in Poland and mortality due to lung cancer among these populations. The findings clearly point to a connection between mortality caused by lung cancer and the benzo(a)pyrene concentration in the air.

39903 **APTIC NO. 61019**

Kaindl, F., P. Kuehn, P. Holzhey, and M. Niederberger

HEART THERAPY WITH ZINC-PROTAMINE-GLUCAGON. *(Herztherapie mit Zink-Protamin-Glucagon). Verh. Deut. Ges. Inn. Med., vol. 78:1099-1101, 1972. 6 refs. Translated from German, 8p.*

The effect of subcutaneous injections of between 1 times 5 and 2 times 10 mg zinc-protamine glucagon on 34 cardiac patients is reviewed. Of the 34 patients, 11 showed no effect at all and 23 showed significant improvement. No side effects such as retching and vomiting occurred. Only two patients showed painful infiltrates at the injection points. Among the successfully treated patients were chiefly patients with coronary heart disease and some with chronically decompensated valvular deficiencies. This contradicts animal experiment findings of a lacking positive inotropic glucagon effect with chronic cardiac insufficiency. Other effects not directly attacking the contraction mechanism must be considered since they may have a bearing on the total organism and not just on the isolated muscle preparation. Accordingly, a trial therapy with glucagon is thoroughly justified in cases of uninfluenceable cardiac insufficiency, especially with bradycardia, conduction disturbances, or ventricular extrasystolia. In this case, the zinc-protamine deposit form is recommended due to its minimum side effects.

39904 **APTIC NO. 62110**

Kaneko, F. and M. Oka

ON THE INCREASE OF THE NUMBER OF DEATHS DUE TO AIR POLLUTION, PART 4: THE VARIATION OF THE NUMBER OF DEATHS AT THE TIME OF OCCURRENCE OF CONTINUED SMOG WITH HIGH CONCENTRATION IN OSAKA CITY, DEC. 1970. *(Taiki osen ni yoru shibosha-su zodai ni tsuite -dai 4 po-1970 nen 12gatsu, renzoku konodo sumoggu hasseiji no Osaka shinai shibosha no hendo). Text in Japanese. Osaka-Shiritsu Eisei Kenkysho Hokoku (Rept. Osaka City Inst. Hyg.), no. 35: 133-134, 1972.*

Mortality before and after the smog episode of Dec. 16-18, 1970 in Osaka was examined. The average daily number of deaths before the smog episode was 45.0; during and after the episode it was 50.2. The average temperature, average aerial concentration of sulfur dioxide, and average amount of dusts for the two periods were 8.5 and 8.0 C, 0.068 and 0.119 ppm, and 0.097 and 0.375 mg/cu m, respectively. The actual number of deaths on Dec. 21 was 58. Causes of death other than accident were classified as diseases of the circulatory system, subdivided into diseases of the cerebrovascular system, heart disease, and other circulatory problems; respiratory diseases; and other diseases. Deaths by respiratory disease did not show an increase after the smog episode. There was a slight increase in mortality resulting from circulatory diseases, and chronic and rheumatic heart disease caused the death of seven patients out of 15 during the smog episode. There was no correlation between mortality and old age, but infants below the age of 1 yr showed an increase in mortality of about 1.6 during the smog episode.

39905 **APTIC NO. 61636**

Kilburn, Kaye, H.

MODES OF ALVEOLAR RESPONSE TO INSULT. *In: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 4, p. 39-59. 23 refs.*

The modes of reaction of alveoli of the lung to several hundred damaging agents are discussed. The patterns of response develop in three zones: the alveolar surface, cells of five types, and the interstitial spaces. The responses to injury include not only damage but repair at the biochemical and morphological levels. The surface properties of the lung are altered to produce disease in response to environmental agents by transudation of fluid and by failure of clearance or of reabsorption. Viruses or chemical damage from cadmium, nickel carbonyl, radiation, phosgene, and nitrogen dioxide change the lining alveoli. Disturbances of connective tissue in the lung include an increase of the connective tissue in alveolar walls and loss or redistribution of connective tissues so that alveolar duct partitions within the secondary lobules are lost.

39906 **APTIC NO. 61033**

Kimura, Masami

METALLOTHIONEIN. *Igaku no Ayumi (Progr. Med.), 83(1):1-10, 1972. 42 refs. Translated from Japanese, 26p.*

Environmental damage caused by heavy metals such as mercury and cadmium has been related to metallothionein protein. The knowledge that has been gained up to the present time on metallothionein and the heavy metals are reviewed. Metallothionein has been classified as a nonenzymatic protein. Various properties of this protein are reviewed. The excretion, distribution, and accumulation of cadmium is reviewed and related to metallothionein. It is possible that the appearance of heavy metal poisoning is prevented by the protection systems provided for the living body by metallothionein. Studies have been made of the administration of radioactive isotopes of heavy metals to animals. Radioactive metallothionein was then separated from the organs. The formation of this compound, its bonding with heavy metals, and its components are discussed. Although there have been many studies of the relationship between heavy metals and metallothionein, the biological role of this protein remains unclear.

39907 **APTIC NO. 61958**

Kleinerman, J.

MULTIPLE FACTOR ETIOLOGY IN CHRONIC OBSTRUCTIVE LUNG DISEASE. *In: Multiple Factors in the Causation of Environmentally Induced Disease. D. H. K. Lee and P. Kotin (eds.), New York, Academic, 1972, Chapt. 5, p. 57-82. 53 refs.*

Etiological agents in the development of emphysema and chronic bronchitis are reviewed. Pathologic studies of well developed cases indicate that several forms of tissue alteration can exist and it is unlikely that a single agent or injury is responsible for the diverse pathologic changes. It is useful to recognize that cigarette smoke and air pollution are complex mixtures of gases, particulates, and fumes, and combination of these agents may affect the anatomic and functional alterations, provided they are applied with sufficient frequency. There is no indication as to how these agents may cause tissue breakdown such as is seen in emphysema, although their effects in causing epithelial hyperplasias and metaplasias and granular hyperplasias of chronic bronchitis are well documented. The intermediate for the induction of the destructive phase may be intercurrent viral or bacterial infection of the respiratory apparatus. Occupational exposures also may be considered as cofactors rather than primary or initiating events. (Author summary modified)

39908 **APTIC NO. 62703**

Laitinen, H. A.

OVERVIEW OF EFFECTS OF TRACE METALS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 41-44. 9 refs. (Oct. 31-Nov. 2.)*

Trace metals are reviewed including those essential to life (such as iron, copper, zinc, manganese, cobalt, nickel, molybdenum, and vanadium), those which act as poisons at high concentrations and as micronutrients at low concentrations (selenium, chromium, and arsenic), and those which are not known to be essential to life processes which can be toxic (such as lead, mercury, and cadmium). The transport and distribution of trace metals, manmade and natural sources, biological effects on plants, animals, and man, and mechanisms of absorption into animals and plants are reviewed generally.

39909 **APTIC NO. 62192**

Lewis, George P., William J. Jusko, Linda L. Coughlin, and Stuart Hartz

CADMIUM ACCUMULATION IN MAN: INFLUENCE OF SMOKING, OCCUPATION, ALCOHOLIC HABIT AND DISEASE. *J. Chronic Diseases, vol. 25:717-726, 1972. 23 refs.*

The concentrations of cadmium in wet ashed autopsy samples in kidney, liver, and lung tissues from 172 adults were measured using atomic absorption spectrophotometry. The values for total organ content of the metal were calculated. The mean values for 34 nonsmokers (11 females and 23 males) were 4.16 + or - 0.51 mg for kidneys; 2.28 + or - 0.25 mg for livers: and 0.36 + or - 0.053 mg for lungs. In contrast, comparable values for 138 male smokers were 10.28 + or - 0.57 for kidneys; 3.06 + or - 0.16 for livers; and 0.81 + or - 0.053 mg for lungs. When smoking habits were related to organ Cd content, a positive correlation between cigarette smoking and Cd accumulation in each of these organs emerged. Patient characteristics such as occupation, alcoholic habits, and the autopsy diagnoses of chronic bronchitis and emphysema, cancer of the bronchus or lung, and arterial hypertension, did not affect the association found between cigarette smoking and Cd accumulation. A multiple regression analysis of composite values (total estimated Cd content of kidneys + liver + lungs) for each subject gave strong support to the hypothesis that cigarettes are a major source of Cd to man and, in addition, can contribute more to the total body burden than the amount derived from other sources.

39910 **APTIC NO. 61644**

Macklem, P. and K. H. Kilburn

TRACHEOBRONCHIAL RESPONSE TO INSULT. *In: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.). New York, Academic, 1972, Chapt. 3, p. 31-38. 27 refs.*

The various tracheobronchial responses to insult are discussed in relation to carcinogenesis and include acute and chronic processes. The acute process are cough; three types of bronchoconstriction: reflex, humoral transmission, and direct; mucus secretion; ciliary dysfunction; and inflammation. The chronic processes are inflammation; ciliary dysfunction; neoplasia; two types of mucus secretion: mucous gland hyperplasia and goblet cell metaplasia; and possibly bronchoconstriction.

39911 **APTIC NO. 61017**

Mikshich, J.

PROVOCATION OF PULMONARY EMPHYSEMA IN GUINEA PIGS THROUGH ADMINISTRATION OF CADMIUM CHLORIDE INTRATRACHEALLY. *(Izazivanje plucnog emfizema na zamorcima davanjem kadmijevog klorida intratrahealno). Arhiv. Hig. Rada, vol. 23:109-121, 1972. 34 refs. Translated from Yugoslavian, 16p.*

Experimental emphysema was induced in guinea pigs in order to prove the pathogenetic role played by the inflammation factor. Biochemical and physiological tests were carried out on 27 animals with induced pulmonary emphysema and on 21 normal animals which served as the control group. An 0.1 cu cm solution of cadmium chloride for each 100 g of body weight was injected into the trachea to induce the emphysema. The prevalence rate of pulmonary emphysema in the groups ranged from 3.4 to 26.5%, with an average of 45%. Histological changes of expressed alveolar emphysema with attendant inflammatory changes were found in the specimens with emphysema ranging from hyperplastic to atrophic changes in the pulmonary parenchyma. In Homogeneous cultures of lung tissues from inflamed lungs, statistically significant decreases were found in the quantity of lipoproteic lipase. This was even more pronounced with profound emphysema. Decreases in the quantity of free fatty acids were also found; they were moderate in light and greater in profound emphysema, but were not statistically significant. A decrease of phospholipids in the blood was found in all cases (61.22 mg versus 69.3 mg in the control group), but the quantities were not statistically significant. A connection was found between the biochemical and pathogenetic- histological changes which appeared in hypoxia of lung tissue in emphysema. Inflammation was the leading pathogenetic factor in the formation of emphysema, followed by obstructive, hypoxic, and atrophic alterations in lung tissue. In judging the effect of fusible cadmium ions which come into contact with the respiratory tract as a compound, both the acute toxicological results and its role as a factor in pneumoconiosis must be considered.

39912 **APTIC NO. 62843**

Miller, Klara and J. S. Harington

SOME BIOCHEMICAL EFFECTS OF ASBESTOS ON MACROPHAGES. *Brit. J. Exp. Pathol., vol. 53:397-405, 1972. 51 refs.*

The in vitro effects of chrysotile, crocidolite, and amosite asbestos, and silica and rutile dust, were assessed on hamster peritoneal macrophages. The release of acid phosphatase into the culture medium and changes in the composition of phospholipids in the cells were estimated. Chrysotile was as toxic as silica, while crocidolite, amosite, and the control dust rutile, were inert. The toxicity of chrysotile and silica was due to the surface interaction of the dusts with phagosomal membranes, leading to the release of lytic enzymes from the damaged phagosomes into the cytoplasm. Considerable amounts of acid phosphatase were released into the medium 28 hr after the phagocytosis of both dusts, whereas very little was found when crocidolite, amosite, and rutile were used. Further evidence of cytopathic effects was the change in lipid components of cells which had ingested silica and chrysotile. A decrease in total lipid content and an increase in lysolecithin apparently indicated specific, secondary, and toxic effects following the release of lysosomal enzymes.

39913 **APTIC NO. 61961**

Morrow, Paul E.

AIRBORNE CONTAMINANTS. *In: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.). New York, Academic, 1972. Chapt. 6, p. 71-90, 46 refs.*

The sources and kinds of airborne contaminants are reviewed and their relationship to human health are discussed. There are four sources of pollutants: urban pollution, occupational pollution, natural pollution, and personal pollution. The urban air pollutants which are associated with respiratory dysfunction or disease are smogs, oxidant gases (particularly ozone), and carbon monoxide. Many industrial contaminants are identical to those produced by cars and stationary sources in urban areas. Asbestos appears to be a major problem; it is a carcinogenic material capable of affecting populations outside of the industry. In limited areas, odor and fume problems are well known. The effect of air contaminants of natural origin on the human respiratory system has not been studied extensively, probably because the airborne levels of these contaminants are ordinarily small in terms of other human exposures. The foremost form of personal air pollution is that associated with tobacco smoking. Others are aerosol sprays and enzyme detergents.

39914 **APTIC NO. 62113**

Nose, K.

AIR POLLUTION AND BRONCHIAL ASTHMA IN CHILDREN, PART I. *(Taiki osen to shoni kikan-shi zensoku -dai 1po). Text in Japanese. Minzoku Eisei (Human Hyg.), 38(6):279-280, Nov. 1972. (Presented at the Japanese Society of Human Hygiene, Annual Meeting, 37th.)*

Questionnaires filled out by 6136 children aged 1-14 in Tokuyama and Shin-nanyo were examined to discover the relationships between air pollution and respiratory disease. Morbidity of asthma, asthmatic bronchitis, and bronchitis increases sharply during the ages of 3-5, and decreases rapidly after the age of 6. There was a significant correlation between air quality measurements of sulfur dioxide and dusts and morbidity of these respiratory diseases. Medical examinations of 289 outpatient children show that 31% are suffering from asthma, 1% from allergic bronchitis, and 15% from asthmatic bronchitis. Geographical, seasonal, allergic, and medical history factors are discussed.

39915 **APTIC NO. 61044**

Schicha, H., K. Kasperek, H. J. Klein, and L. E. Feinendegen

DETERMINATION OF TRACE ELEMENT CONCENTRATIONS IN THE CEREBRAL CORTEX AND BASAL GANGLIA IN MAN AND THEIR DEPENDENCE OF AGE. *(Bestimmung von Spurenelementkonzentrationen in Hirnrinde und Basalganglien beim Menschen und ihre Abhaengigkeit vom Lebensalter). Forstchr. Geb. Roentgenstr. Nuklearmed., 1972:184-185, 1972. Translated from German, 6p.*

Sixteen tissue samples were taken about 20 hr post mortem from six human brains from eight different brain regions. Trace element determination was performed analytically by neutron activation without radiochemical separation. The essential elements cobalt, iron, rubidium, and zinc were determined with a relative analytical error of less than 5%, while the nonessential elements silver, chromium, cesium, and scandium produced analytical errors on an average of 10 to 20%. In the basal ganglia of adults, in contrast to the cerebral cortex, significant concentrations of the elements Ag, Cr, Sc, and Fe were found. The concentrations of Co and Rb were only slightly increased, whereas there were no significant differences for Zn and Cs. The uniform concentration of Fe in all brain sections in newborn infants increased until about the age of 8, and was differentiated in the various regions of the brain. In addition, the specific Fe concentrations clearly remained constant. In the case of the motor cerebral cortex and gyrus of Broca, a significant lateral difference was found in favor of the left hemisphere. Rubidium decreased continuously in the brain with increasing age.

39916 **APTIC NO. 62268**

Schroeder, Henry A., Isabel H. Tipton, and Alexis P. Nason

TRACE METALS IN MAN: STRONTIUM AND BARIUM. *J. Chronic Diseases, vol. 25:491-517, 1972. 68 refs.*

Strontium and barium were analyzed in about 400 humans from many areas of the world by emission spectrography. Strontium was omnipresent in human tissues, 99% was stored in bone. In soft tissues, highest concentrations were in the aorta, larynx, trachea, and the lower gastrointestinal tract. Barium was found in all tissues with 93% in bone, but not all samples contained it. There was more barium in most tissues of foreign subjects than of Americans, and more strontium in the kidney and liver. Adults and children from the Far East had more Sr in the bone than Americans. Barium tended to accumulate in or to be lost from some tissues with age; Sr acculumated only in the lung and aorta. Infants had higher concentrations of both metals than adults and children. Barium in human soft tissues was significantly correlated with most essential trace metals; Sr was not. Concentrations of Sr were highly correlated with calcium; both metals occur in newborn infants.

Human strontium exposures were evaluated by analyses of 100 food and 20 water samples. Large concentrations were found in species, sea foods, grains and cereals, root and leafy vegetables, and legumes. Urinary excretion of ingested Sr was 11% and of Ba was 3%. Considerable Sr can be excreted in sweat. More than 2/3 the Sr and nearly 3/4 the Ba present in soft tissues comes from diet. Barium and strontium are ubiquitous in relatively high concentrations in the geosphere and are found in all living organisms analyzed. There is more Ba than Sr in soils, most rocks, and some coals. Marine organisms concentrate both metals from sea water. Strontium behaves largely, but not completely, as an essential trace metal in the biosphere and in mammals. Data on Ba are less convincing. It is possible that Sr in small amounts acts to harden the structures of bones and teeth. While it is possible that Sr is concerned in dental caries and senile osteoporosis, the evidence is unconvincing. (Author summary modified)

39917 **APTIC NO. 61683**

Shy, Carl M., Victor Hasselblad, Leo T. Heiderscheit, and Arlan A. Cohen

ENVIRONMENTAL FACTORS IN BRONCHIAL ASTHMA. *In: Environmental Factors in Respiratory Disease. Douglas H. K. Lee (ed.), New York, Academic, 1972. Chapt. 15, p. 229-235. 17 refs.*

Three environmental factors influence asthma rates in a community: the fall season, cold temperatures, and air pollution. These determinants of asthma frequency should be considered in the design and analysis of studies attempting to elucidate etiological or contributing factors in asthma attacks. Cold temperatures appear to exert a stronger effect than atmospheric pollutants on attack rates. At moderate temperature ranges (50 F and above) air pollutants have a relatively stronger independent effect on asthma frequency and this effect was observed at atmospheric levels commonly experienced in urban areas.

39918 **APTIC NO. 61963**

Smith, R. G.

FIVE OF POTENTIAL SIGNIFICANCE. *In: Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 6, p. 139-162. 45 refs.*

The ecology, toxicity, and air pollution effects of chromium, manganese, nickel, vanadium, and arsenic are reviewed. Chromium particles are widespread in the air, water, soil, and animal and vegetable life. Levels in particulate matter from stations reporting to the National Air Sampling Network have averaged over a number of years slightly more than 0.01 microgram/cu m, while the highest reported values is 0.35 microgram/cu m. All compounds of Cr are toxic in sufficiently high concentrations, but the metal itself is very nearly inert and does not constitute an air pollution problem. Plating plants and industries are the major sources of chromate pollution. Manganese is the 12th most abundant element and is toxic. Air pollution may result from its use in fertilizers. However, manganese compounds as manganese dioxide in the ambient air act to catalyze the oxidation of sulfur dioxide. Nickel levels constitute about 0.3% of the total suspended particulate matter in cities. There are no known environmental quality standards for Ni but it is a known carcinogen. The toxicity of vanadium is dependent upon its valence. There are no environmental air standards for it or its compounds, although it results from the burning of fuel, coal, and in the manufacture of steel. Arsenic is virtually everywhere and all its compounds are toxic, and may be lethal. There are no air quality standards for Ar and it does not appear to be a growing threat to the environment.

39919 **APTIC NO. 61020**

Smolyar, V. I.

CONGENTIAL IMPAIRMENTS DURING NUTRITIONAL DEFICIENCY IN TRACE ELEMENTS. *(Vrozhdennye narusheniya pri alimentarnom defitsite mikroelementov). Pediatriya, 51(10):75-78, Oct. 1972. 52 refs. Translated from Russian, 9p.*

Studies on the teratogenic effect of trace elements are reviewed. In several animal studies, it was determined that hydrencephalia was the result of B12 (cobalt) deficiency. Vitamin B12 deficiency usually does not occur in people on a normal diet, since it occurs in sufficient quantities in products of animal origin (meat, milk, eggs). However, if vegetative foods are used predominately, the organism may not be supplied with sufficient B12. When food with a large amount of fat and proteins is consumed, more B12 is needed. Vitamin B12 participates in the biosynthesis of methyl groups, thus the addition of methyl group donors counteracts the development of vitamin B12 deficiency. Anemia cases have been described caused by a vitamin B12 deficiency in pregnant organisms and reduced cobalt in the blood. Large areas of the world have a low copper content in the soil. This can lead to copper deficiency in animals grazing on the land. Copper deficiency can cause impairment of biosynthesis of the phospholipids and thus demyelination of the nervous system. Copper insufficiencies in offspring have been described as a result of insufficient copper in the diet during pregnancy and normal copper in the food but increased molybdenum copper antagonizer. Zinc deficiency can cause disruption of pregnancy, weakening of offspring, and abnormalities of offspring. Manganese insufficiency can also cause early death of offspring born from animals with a Mn deficiency. Skeletal deformities, ataxia, and other impairments can occur. Thus, nutritional insufficiency of cobalt (B12), copper, manganese, and zinc can lead to impairment in the embryonic development of the fetus. Teratological effects do not occur in these cases. When the trace element insufficiency is more moderate, embryomorphous changes can occur.

39920 **APTIC NO. 61041**

Sulkowski, Wieslaw, Janusz Izycki, Janina Adamiak-Ziemba, and Grazyna Stroszejn

CHANGES IN THE UPPER RESPIRATORY TRACT IN WORKERS EXPOSED TO VANADIUM. *(Zmiany w gornych drogach oddechowych u pracownikow narazonych na wanad). Otolarynogol. Polska (Warsaw), 26(2): 165-172, 1972. 14 refs. Translated from Polish, 12p.*

Fifty-three workers employed in making repairs to oil-fired boilers in heat and power generating plants and exposed to the effects of vanadium pentoxide dust in concentrations significantly in excess of those set by the National Standard Specifications were examined and their health compared with that of a control group of 22 persons. Characteristic forms of acute and chronic changes were found as a result of the exposure, with the preponderance of the symptoms confined to the upper respiratory tract. Immediate effects of exposure were acute catarrhs or exacerbated chronic catarrhs of the upper resporatory tract. Thirty percent of the workers suffered from acute or chronic exacerbated changes of this type due to the irritating vanadium dust. Allergic reactions were also possible. Permanent effects occurred in 45% of the workers.

39921 **APTIC NO. 61638**

Tepper, L. B.

BERYLLIUM. *Metallic Contaminants and Human Health. D. H. K. Lee (ed.), New York, Academic, 1972. Chapt. 5, p. 127-137. 3 refs.*

The relationship between beryllium and human health is discussed. Beryllium is not widely distributed in nature disseminated in ambient community atmospheres. Exceptions are discharges of Be dust from poorly-controlled industrial operations. Small amounts of Be, probably contained in beyrl, may be detected in the air of communities using coal as fuel. The occurrence of Be disease is controlled through the application of standard and special air cleaning and ventilation techniques. Periodic monitoring of the air concentration of Be is important to the maintenance of acceptable working conditions. The following limiting air concentrations for Be are recommended: For workroom air: threshold limit value of 2 micrograms/cu m as time weighted average during an 8-hour day. During any 30-

minute period, a level of 25 micrograms/cu m is not to be exceeded. For community air: threshold limit of 0.01 microgram/cu m measured at breathing height and averaged over 1 month.

39922 **APTIC NO. 62327**

Welch, W. R. and C. G. Wilber

LEAD IN TISSUES OF ROADSIDE MICE. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 181-199, 1972. 14 refs.*

NTIS: PB 223623

Lead concentrations in the tissues of deer mice trapped along a highway at locations of different traffic volumes were compared to those of mice in remote areas and at decreasing proximities to a highway. In general, as the traffic volume increased, the amount of lead in the animals increased. Similarly, the amount of lead decreased as the animals were placed more remotely from the highway. Correlation coefficients for these relationships were significant. Thus, lead from automotive sources at low exposure levels accumulated in the tissues of the deer mice in a natural state. Whether the accumulation was the result of inhalation of lead aerosols, of ingestion of lead on plant surfaces, or from the fur during grooming, could not be determined. The important fact was that the more automotive traffic occurring in the vicinity of the animals, the greater the lead content of their tissues. (Author abstract modified)

39923 **APTIC NO. 61647**

Wyatt, John P.

ENVIRONMENTAL FACTORS IN CHRONIC LUNG DISEASE. *In: Environmental Factors in Respiratory Disease. D. H. K. Lee (ed.), New York, Academic, 1972, Chapt. 9, p. 119-137. 47 refs.*

The relationship between chronic lung disease and air pollution is reviewed. Various laboratory observations support the idea that urban air contaminants, such as sulfur dioxide, photochemical oxidants, oxides of nitrogen, and various hydrocarbons can be shown to affect adversely the various protective mechanisms of the respiratory tract, such as ciliary movement, mucus production, and pulmonary clearance of infectious disease agents. A 1970 extensive review of the literature dealing with air pollution and respiratory disease concluded that the significant explanatory variable for all fatal cases of bronchitis was air pollution. It was calculated from Buffalo, N. Y., health statistics that the mortality for asthma, bronchitis, and emphysema could be reduced 50% if the air in all of Buffalo were cleansed to equal the purity of those areas that had the best air.

39924 **APTIC NO. 61916**

Yamaoka, S., M. Fukuda, M. Oka, and O. Fukase

EXPERIMENTS OF EXPOSING ANIMALS TO URBAN POLLUTED AIR, PART I. *(Toshi osen taiki ni yoru dobutsu bakuro jikken -dai 1 po-). Text in Japanese. Osaka-Shiritsu Eisei Kenkysho Hokoku (Rept. Osaka City Inst. Hyg.), no. 35:134-135, 1972.*

Three groups of 24 rats were raised in two polluted ambient atmospheres and one clean room for 100 days. Their body weights were determined three times a week and half of each group was sacrificed after 30 days and the remaining rats at the end of the exposure period to examine the weights of the lungs, liver, kidneys, adrenal glands, and the spleen; the water content, protein content, and proteinase activity of the lung; and the serum anti-trypsin activity. The temperature, humidity, sulfur dioxide concentrations, sulfite mist, and suspended dusts in each area were periodically determined. The temperatures at the two polluted areas were almost the same, ranging from 10-30 C, and the temperature in the clean room was 18-29 C. The relative humidity at the polluted points was 49-90% and 40-80% in the clean room. Monthly averages of aerial SO2, SO3 mist, and floating dusts at the polluted areas were 0.034-0.077 ppm, 6.7-9.5 micrograms/cu m, and 0.076-0.128 mg/cu m, respectively. Clean room values were less than 0.01 ppm of SO2 and 0.02 mg/cu m dust. No significant differences were noted in the total body weight at the three places. The weight of the liver, kidneys, adrenal glands, and spleen of the rats from the polluted area showed an increase at the 30th day of exposure, as compared to rats from the clean room. The liver, however, showed no increase at the 100th day. Serum anti-trypsin activity in the polluted area rats showed an increase at the 30th day, but not at the 100th. No significant differences were recognized in the water content, protein content, or proteinase activity of the lung in any of the rats.

39925 **APTIC NO. 61917**

Yamaoka, S., M. Fukuda, M. Oka, Chin Shin Ton, and O. Fukase

EXPERIMENTS OF EXPOSING ANIMALS TO URBAN POLLUTED AIR, PART II: ON THE HISTOLOGICAL FINDING OF THE TRACHEA AND THE LUNG. *(Toshi osen taiki ni yoru dobutsu bakuro jikken -dai 2 hokikan, hai no soshiki shoken ni tsuite). Text in Japanese. Osaka-Shiritsu Eisei Kenkyusho Hokoku (Rept. Osaka City Inst. Hyg.), no. 35:135- 137, 1972.*

The lungs and tracheas of three groups of rats raised in two polluted ambient atmospheres and a clean room were histologically examined. The trachea and lungs of the control rats showed no abnormalities. The rats raised in polluted atmospheres showed conspicuous proliferation and ablation of the mucosal epithelium, accentuation of mucus secretion, and inflammatory lymphocyte infiltration of the submucosa in the trachea. Lungs of the rats raised in both polluted areas showed lymphatic infiltration of the bronchial wall, denaturation and ablation of the bronchial epithelium, proliferation of the lymphatic apparatus, and the appearance of dust cells. Chronic tracheitis and chronic bronchitis appeared at about the same rate and frequency in the two polluted areas of Osaka, and the control rats showed no conspicuous anomalies.

39926 **APTIC NO. 61048**

Yamashita, Noriyoshi, Makoto Doi, Masashiei Nishio, Hiroatsu Hoji, and Masato Tanaka

CURRENT STATE OF KYOTO CHILDREN POISONED BY ARSENIC TAINTED MORINAGA DRY MILK. *(Kyoto ni okeru Morinago Hiso miruku chudoku hisaiji no genjo). Nihon Eiseigaku Zasshi (Japan. J. Hyg.), 27(4):364-399, Oct. 1972. 104 refs. Translated from Japanese, 117p.*

The poisoning, of Japanese children in 1955 by arsenic-contaminated dry milk is reviewed, and results of a follow-up survey of children from the Kyoto area are presented. From Oct. 1970 to July 1971, the follow-up survey was made of 554 chidlren. It consisted of an epidemiological survey, clinical medical examinations, and clinical psychological examinations. In the epidemiological and clinical psychological surveys, comparative studies were made with control groups. Most of the afflicted children complained of various physical symptoms or mental and behavioral troubles. The percentage of complaints was obviously higher than in the general population of the same age group. The average body weight of the affected children was obviously inferior to that of the general population of the same age group. The percentage of positive albumin in urine was obviously higher, and the percentage of occurrence of abnormal brain wave findings was obviously higher. There was a tendency for the percentage of abnormal brain wave findings to increase in the children who ingested the arsenic-tainted dry milk at an earlier period. Many children displayed symptoms of central nervous system diseases such as epilepsy and minimal brain damage. The poisoned children also had more hearing problems, more anomalies of eye refraction, more pigmentation or depigmentation of skin, more tooth enamel dysplasia, and more individuals with an IQ of 85 or less, han the normal population. Many chidlren had not acquired formal, logical thought operations. Many complained of irregular or impaired menstruation. More children were atypical in mental tests than in the general population of the same age group.

39927 **APTIC NO. 62819**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

CHEMICAL STRUCTURE AND FUNCTION OF THE LUNG (FINAL REPORT). *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health, Education, and Welfare Publication No. (NIH) 73-432, p. 15-29, Oct. 1972. 41 refs.*

The chemical structure and function of the lung is reviewed in terms of connective tissue structure of lung parenchyma and airways; chemical mechanisms of pulmonary injury; structure, synthesis, and physical characteristics of bronchial mucus; lung synthesis of phospholipids and proteins; intermediate metabolic functions by lung tissue; glycoprotein structure of the lung; and special problems of implementing studies on lung structure and function. Little is known about the chemistry, physical properties, or sites and rates of synthesis and degradation of lung components. Studies are needed on proteolytic enzymes and their naturally occurring inhibitors in circulating leucocytes, alveolar macrophages, platelets, serum and lung tissue; synthesis and physiochemical characteristics of bronchial mucus; turnover rate of various types of lung cells; the chemistry of surface active material of lung cells; and metabolic pathways available in the normal and diseased lung.

39928 **APTIC NO. 62820**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

NON-ALLERGIC AIRWAYS DISEASES (FINAL REPORT). *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health, Education, and Welfare Publication No. (NIH) 73-432, 45-61, Oct. 1972. 27 refs.*

Non-allergic respiratory airways diseases, particularly chronic bronchitis and emphysema, are reviewed in terms of magnitude of the problem and current state of knowledge concerning natural history, etiology and pathogenesis, pathology, pathophysiology, pulmonary defense mechanisms, and research approaches. Chronic bronchitis and emphysema are irreversible by the time the patient presents with symptoms. Early diagnosis depends upon development of a simple reliable noninvasive test which can be widely applied to apparently healthy persons. Animal models of both emphysema and chronic bronchitis are now available but are not being adequately exploited to study the pathogenesis and possible therapeutic regimens fo these diseases. Although there appears to be a good correlation between the obstruction in peripheral airways and the lesions observed, additional knowledge of the physiological consequences of specific components of the lesions, such as goblet cell metaplasia, inflammation, scarring, and mucus plugs, is needed to determine the contribution of each to the resulting disability.

39929 **APTIC NO. 62821**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

ALLERGIC AIRWAYS DISEASE: ASTHMA (FINAL REPORT). *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health, Education, and Welfare Publication No. (NIH) 73-432, p. 63-72, Oct. 1972. 11 refs.*

Asthma, a chronic reversible obstructive airways disease, is reviewed in terms of magnitude of the problem and current state of knowledge concerning etiology, pathogenesis, host defense, and model systems. The mechanisms involved in the control of airways in asthma appear to include the interaction of neutral pathways and pharmacologic mediators which are activated by both immunologic and nonimmunologic triggers. The basic defect for the disease seems to be an altered state of the host. Individuals with a history of asthma, or any atopic disease, usually show a raised sensitivity and increased reactivity to vasoactive amines. Predisposing factors include: a genetic predisposition, local end-organ hypersensitivity to pharmacologic agents, irritants, and specific allergens, and a special form of immunologic response leading to the release of specific chemical mediators. The natural history of the disease is ill- defined and represents a heterogenous group of syndromes.

39930 **APTIC NO. 62822**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

ENVIRONMENTAL DISEASES (FINAL REPORT). *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health, Education, and Welfare Publication No. (NIH) 73-432, p. 31-44, Oct. 1972. 36 refs.*

Environmental diseases are reviewed in terms of magnitude of the problem and current state of knowledge concerning etiologic factors, dose-response relationships, fundamental research, population studies, and therapy. Cigarette smoking is concluded to be the most important single cause of environmental lung disease. A national, broad research program is seen as needed to investigate occupational pollutants and to determine whether they are also threats to the general population. Fundamental research on lung responses to environmental agents is suggested for studies of the role of infection, enzymes, chemical mediators, immunologic reactions, and pulmonary pathophysiology.

39931 **APTIC NO. 62824**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

CHAIRMAN S SUMMARY. *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health, Education, and Welfare Publication No. (NIH) 73-432, p. 5-14, Oct. 1972.*

A summary is given for a National Heart and Lung Institute task force report on respiratory diseases. Respiratory diseases are concluded to clearly constitute a major national health problem whose magnitude is increasing. The main scientific objectives for research as outlined in the report are: elucidation of pathogenic processes in the lung as a key to developing curative treatment; recognition of endogenous and exogenous etiologic factors as the key to early detection of respiratory disease and to the development of more effective therapeutic regimens; and consideration of clinical problems related to diagnosis and treatment so as to achieve early detection and prevention and to initiate early curative treatment. Present resources are considered inadequate to realize these scientific objectives or to initiate new research directions.

1971

39932 **APTIC NO. 62839**

Beritic, T., D. Dimov, Anka Bunarevic, Marija Sondic, and Anica Sirec

ASBESTOS AND FERRUGINOUS BODIES. *Arhiv Hig. Rada Toksikol. (Yugoslavia), vol. 22:317-322, 1971. 29 refs.*

Asbestos body-like structures (ferruginous bodies) found in some of the smears prepared from the lungs of 450 consecutive necropsies of Zagreb residents were studied with particular reference to the morphological features of the iron-staining reaction of the ferruginous coating. There appeared to be no differences in iron-staining properties of the coating which would serve to distinguish between ferruginous bodies of asbestotic and those of nonasbestotic origin. The color pictures of the unstained (native) and the corresponding stained ferruginous bodies are presented. (Author abstract modified)

39933 **APTIC NO. 59776**

Curie, C.

INCIDENCES OF HUMAN ACTIVITIES IN ATMOSPHERIC POLLUTION. *(Incidences des activites humaines dans la pollution atmospherique). Text in French. Agressologie, no. 12:37-46, 1971.*

Studies on the nature, origin, and formation of atmospheric ions, on the general effects of negative and positive ions on the human organism, and on the respiratory system in particular are reviewed. Large, heavy ions are usually solid or liquid particles suspended in the air, while small, gaseous ions are formed by shock ionization, collision with high-energy particles, and radiation. The space charge increases, and the potential gradient decreases with increasing altitude. The small ion concentration in the atmosphere is usually in a range of 400-1500 pairs per ml. The respective carriers of negative and positive ions in the atmosphere are oxygen as well as carbon monoxide, carbon dioxide, vapors, and smokes. The air pollution threshold is regarded as reached when the ratio of the large ion count to the small ion count equals 50. With a positive space charge, and for a given concentration, the lung capacity may reduce by about 30%. Reduction of the pulsation frequency, increased fragility of the respiratory cilia, reduction of the amplitude and frequency of the peristaltic motion of the bronchial tract, and inhibition of the mucus flow in the presence of positive ions were observed.

39934 **APTIC NO. 62102**

Dolgner, R.

EPIDEMIOLOGY. *(Epidemiologie). In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Text in German. Duesseldorf, Micheal Triltsch Verlag, 1972, p. 129-136. 12 refs.*

Epidemiological surveys conducted among children living in different areas and permanently exposed to different concentrations of dust, sulfur dioxide, and nitrogen dioxide are reviewed. The selection of children for epidemiological surveys has special advantages due to the inherently high susceptibility and reactivity of the juvenile organism, and to the absence of occupational exposure. The epidemiological surveys show relationships between the occurrency of respiratory diseases, lung function, physiological development, and accumulation of foreign substances in the organism and the degree of exposure to air pollutants. Increased incidence of cough, common cold, sore throat, tonsilitis, bronchitis, influenza, and asthma in exposed groups was noted. Increased incidence of acute respiratory diseases, and reduced tidal volume in a NO2-exposed group of children was determined. Enlargement of the tonsils and of the neck and submandibular lymph nodes, both the increased level and resistance of hydrochloric acid in the erythrocytes and plasma protein level, reduced hemoglobin concentration, and significant increase in the frequency of lung diseases were found in children exposed chronically to 180 micrograms/cu m concentration of SO2, and to 20 micrograms/cu m concentration of NO2. Significant reductions in the erythrocyte count, the hemoglobin level, and the 17-ketosteroid excretion in the urine and significant increases in the blood catalase activity and in the coproporphyrin excretion were determined in another group that was exposed to SO2 and NO2 concentrations of 190 micrograms/cu m and 74 micrograms/cu m. Increase in the frequency of the diseases of the lower respiratory tract at SO2 and dust concentrations over 130 micrograms/cu m was shown. Prevalence and aggravation of the disease symptoms at a critical concentration of 90-110 micrograms/cu m for SO2, NO2, and respirable dust was observed. The nondisease effects appear about 50% of this critical concentration.

39935 **APTIC NO. 61674**

Fodor, G. G. and G. Winneke

CARBON MONOXIDE. *(Kohlenmonoxid). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 73-76, 1971. 12 refs.*

Studies on the toxic effects of different concentrations of carbon monoxide on the organism as a function of the carboxyhemoglobin levels are reviewed. The first troubles in the mental and sensorial functions appear when the COHb level reaches values between 2 and 2.5%. Intensification of these troubles and significant reduction of alertness at COHb levels of 2.5-4.5%, and also slowdown of perception performance, impairment of the short-term memory at COHb levels ranging from 4.5% to 9% are observed. The first subjective symptoms of CO poisoning, e.g., headache, appear at COHb levels exceeding 9%. The maximum allowable CO concentration should be set at such a values so that the COHb level does not exceed 2.5%. The maximum allowable 1-hour concentration of 80 ppm, resulting easily in the COHb level of 4% at an alveolar ventilation of 20 l/min, as proposed by VDI, is regarded as too high.

39936 **APTIC NO. 62033**

Fodor, G. G. and M. Zimmermann

ORGANIC VAPORS. OCCUPATIONAL AND GENERAL HAZARDS OF TOLUENE VAPORS. *(Organische Damepfe. Gafaehrdung durch Toluoldaempfe im Berufs- und Alltagsleben). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 62-73, 1971. 52 refs.*

Studies on the acute and chronic toxicity of toluene are reviewed. Most poisonings by toluene are due to inhalation of its vapors, while skin resorption is not significant with 14-23 mg/sq cm/hr. Due to its liposolubility, toluene is accumulated mainly in lipoid-containing organs, such as the adrenal gland, cerebellum, bone marrow, and brain. Toluene is metabolized mainly by oxidation of its methyl group to benzoic acid which becomes water-soluble by conjugation with glycol, and finally eliminated in the urine in the form of hippuric acid. Oxidation of the aromatic ring to phenol compounds is also possible. While the pulmonary elimination and elimination in urine in unchanged form are negligible, the bulk, about 84%, are metabolized to hippuric acid before elimination in the urine. Troubles of the central and sympathetic nervous system, narcosis, paresthesia, equilibrium troubles, headache, insomnia, asthenia, anorexia, nausea, reduced tolerance for alcohol, irritation of the conjuctiva and mucosa of the respiratory tract, lachrymation, and unconsciousness due to inhalation or more or less high concentrations of toluene vapors are observed. Chronic inhalation of toluene vapors causes headache, asthenia, insomnia, psychotic troubles, chest pains, nosebleeding, hepatomegalia, and temporary reduction of the phagocytic activity of the leukocytes. The maximum allowable workplace concentration of toluene vapors in West Germany has been set at 200 ppm.

39937 **APTIC NO. 61675**

Pott, F. and W. Dehnen

LEAD. *(Blei). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 33-43, 1971. 42 refs.*

A critical review is given of studies concerning the occurrence, retention, effects, and excretion of lead in the human organism. Lead concentration measurements conducted by busy streets in New York, Detroit, and Los Angeles gave a yearly average concentration of 4-7 micrograms/cu m. THe lead concentrations were by about 40% higher during daytime than they were during nighttime, and they were also higher during fall and winter than in spring and summer. The rate of deposition of inhaled lead in the lung ranges from 34% to 99%. The rate of pulmonary resorption of inhaled lead is between 80% and 100%. Resorption can be both rapid and quantitative for lead particles smaller than 1 micron. Five to ten percent of the small amount of lead ingested is resorbed in the intestines. Lead that is not resorbed in the gastrointestinal tract is eliminated from the organism in the feces and urine, the kidney being the principal lead-excreting organ. The allowable lead uptake for normal subjects is regarded as reaching the tolerance even for such normal subjects, and even more so for the sick, aged, and for children. The allowable annual rate of increase of 8 mg in the bones may lead to lead poisoning at older age due to possible mobilization in the organism.

1969

39938 **APTIC NO. 61025**

Japan Public Health Assoc.

MEDICAL CONFERENCE ON CHRONIC CADMIUM INTOXICATION AND ITAI-ITAI DISEASE. RECORD OF THE PRESENTATION AND DISCUSSION. *(Mansei kadomyumu chudoku narabi ni iwayuru Itai-itaibyo ni kansuru igaku kenkyukai. Happyo Togikiroku). May 30, 1969. 397 refs. Translated from Japanese, 453p.*

Itai-itai disease, due to chronic cadmium poisoning, is discussed. A method for the epidemiological examination of the itai-itai disease, diagnosis of the disease in Toyama Prefecture, and cases in Nagasaki, Gunma, Miyagi, and Oita Prefectures are described. The nosogenetic mechanisms of chronic cadmium poisoning and the itai-itai disease are discussed in papers on the nosogenetic mechanism, chronic toxicosis caused by oral intake, the abnormal metabolism of inorganic bone salts caused by Cd, changes in the acute toxicity of heavy metals following pre-treatment with metals (with particular reference to Cd), the intestinal absorption of Cd, and experimental studies on renal dysfunction and symptoms in the early stages of Cd intoxication. The differential diagnosis of itai-itai disease and chronic Cd intoxication is described in studies on the itai-itai disease, the differential diagnosis of the itai-itai disease and of chronic Cd poisoning, the influence of Cd and other heavy metals on the health of residents, the relationship between chronic cadmium poisoning and the itai-itai disease, results of medical examinations, the relationship between chronic articular rheumatism and the ita-itai disease, medical examinations of residents along the water system of the Okudake River in Oita Prefecture which is polluted with cadmium from a mine, and the diagnosis of occupational chronic poisoning by cadmium.

1966

39939 **APTIC NO. 61955**

Ghelberg, N. W., I. Gorgan, and I. Checiu

FLUE-HYDROXY-INDOLEACETIC ACID EXCRETION IN THE POPULATION CHRONICALLY EXPOSED TO LOW LEAD CONCENTRATIONS IN THE ATMOSPHERIC AIR. *(Excretia acidului 5-hidroxiindolacetic la populatia expusa cronic la concentratii de plumb din aerul atmosferic). Text in Romanian. Igiena (Bucharest), 15(2):87-91, Feb. 1966. 12 refs.*

The urinary excretion of 5-hydroxy-indoleacetic acid was studied in 227 11 to 12 year old children living near a nonferrous metallurgical plant. The children had been exposed to lead from the plant. A parallel was observed between the proportion of cases with increased 5-hydroxy-indoleacetic acid excretion and increased leas concentrations in the air. The results are interpreted as indicating deviation of tryptophan metabolism. The lead concentrations were 31.4 plus or minus 25.2 micrograms of lead/cu m air, 12.6 plus or minus 11, and 6.3 plus or minus 8.2 micrograms of lead/cu m of air for the three groups of children studied. The threshold concentration was 12.6 plus or minus 11 micrograms of lead/cu m air.

1962

39940 **APTIC NO. 61038**

Toyama, Toshio, Toro Kondo, and Ken ichi Nakamura

ENVIRONMENTS IN ACID AEROSOL PRODUCING WORKPLACES AND MAXIMUM FLOW RATE OF WORKERS. *(San erozoru hassei shokuba no kankyo to sagyosha no saidai kokyu ryuryo). Sangyo Igaku (Jap. J. Ind. Health), 4(8):15-22, Aug. 1962. 19 refs. Translated from Japanese, 19p.*

The effects of acid aerosols on the lung ventilation function was studied on 13 workers in a metal pickling factory and a control group of 10 workers, and on nine workers in a copper refining workshop and a control group of 5 workers. In addition, 11 healthy men were studied to discover what changes occurred in the ordinary peak flow values with bronchodilators. Hydrochloric acid aerosols were generated in the pickling plant for an electrical appliance manufacturing factory, and sulfuric acid aerosols were generated in the electrolysis plant of a copper refining factory. Measurements of peak flow rates were taken before the workers entered the workplace, after 1 hr in the workplace, and after inhalation of a bronchodilator. The concentration of HCl aerosols was 8.68 mg/cu m, and the concentration of H2SO4 aerosols was 1.88 mg/cu m, these were slightly over the permissible concentrations. The average particle diameters were 6 and 3 micron, respectively. The peak flow values of the control groups declined after exposure to the acid at 9% and 2% rates, respectively. In workers ordinarily exposed to H2SO4 aerosols, the values remained unchanged, or in some cases even tended to increase. Hydrochloric acid aerosols with larger particle diameters caused more pronounced and more immediate changes than H2SO4. The bronchodilator caused pronounced changes in the control group and less in the workers. Thus, when a person not habituated to acid aerosols inhales them, abrupt stricture of the respiratory tract occurs. This a transient phenomenon. When there is prolonged occupational exposure, the respiratory tract reaction becomes dulled. Factors such as the chemical properties and sizes of the aerosols affect the reactions. With HCl, the reaction is relatively transient and intense; with H2SO4, the changes are more chronic.

1960

39941 **APTIC NO. 61046**

Nakagawa, Shochu

A STUDY OF OSTEOMALACIA IN TOYAMA PREFECTURE. (THE SO-CALLED ITAI-ITAI DISEASE). *(Toyamaken ni hassei shita kotsunankasho no kenkyu (Iwayuru itai-itai byo)). Kanazawa Irigaku Sosho (J. Radiol. Phys. Ther.), vol. 56:1-51, 1960. 92 refs. Translated from Japanese, 108p.*

An endemic disease called Itai-Itai (ouch-ouch) began to appear in Kumano and Shinbo villages along the banks of the Jinzu River in Toyama Prefecture, Japan, during the final stages of World War II. In 1955 and 1956, studies were made of 15 patients from Kumano and 15 from Shinbo. The incidence of the disease was high in the localized district after the war. It chiefly involved multiparae in menopausal women. A waddling gait appeared in association with limited rotation of the hip joints, and there was characteristic deformation of and pain in the bones. There was a reduction in serum inorganic phosphorus and an increase in alkaline phosphates. Atrophy, curvature, and characteristic transformation zones appeared in the x-rays. Growth of osteiod tissue appeared in the histopathological findings in autopsy and biopsy. On the basis of these finding, the Itai-Itai disease was diagnosed as osteomalacia. A diagnosis of menopausal and senile osteomalacia was made. When massive vitamin D treatment was given, there was a dramatic improvement in the clinical symptoms. Radiologically, there was improvement of bone atrophy and healing of the transformation zones. Some patients were almost completly cured. An effort was made to determine the etiology and morphological characteristics of the disease and to understand the healing process brough about by vitamin D treatment. Thus, the Itai-Itai disease was not caused by metal poisoning as some have suggested, but rather was due to vitamin D deficiency due to poor nutrition in the villages.

39942 **APTIC NO. 61045**

Yoshikawa, Toshio, Jiro Utsumi, Toshio Okada, Masana Moriuchi, Kanji Ozawa, and Yuko Kaneko

CONCERNING THE MASS OUTBREAK OF CHRONIC ARSENIC TOXICOSIS IN NIIGATA PREFECTURE. *(Niigata kenka ni hassei seru shudan mansei hiso chudokusho ni tsuite). Chiryo (Therapy), 42(9):1739-1749, Sept. 1960. 42 refs. Translated from Japanese, 36p.*

Chronic arsenic toxicosis occurred on a mass scale in about 80 individuals in Niigata Prefecture because of well water. Plants in the area manufacture arsenic trisulfide, an important component in paints. The water used to wash arsenic trisulfide precipitates to precipitate arsenic are discharged as waste water by underground seepage. The liquid wastes could have easily seeped into the well water. The detection of arsenic in the well water, the incidence of poisoning in the patients, and the effects of arsenic are described. Various autopsy, animal experiment, and clinical findings in 26 patients poisoned by the well are described. The patients had dermatological findings including melasma, keratosis, white spots, and other abnormalities. They also had swelling of the liver and hematological ane enzyme abnormalities. Decreases in albumin and increases in gamma globulin occurred in the serum protein of severely affected patients. Liver function and electrocardiogram test results are also discussed. The therapeutic method used was a daily dosage of 2.5 mg/kg BAL and a dose of a liver protecting agent. Case studies are described.

1956

39943 **APTIC NO. 61049**

Kitamura, Y., M. Miyao, K. Kawazoe, Y. Kinoshita, H. Hirashima, C. Toi, E. Katsura, and H. Matsuda

CHRONIC ARSENIC POISONING IN MF-DRIED MILK FED INFANTS. *(MF Funnyu ni yoru nyuyoji mansei hiso chudokusho). Shikoku Igaku Zasshi (Shikoku Acta Medica), 8(4):205-225, 1956. 40 refs. Translated from Japanese, 66p.*

In 1955, a disease with an unknown cause occurred among many infants in western Japan. The initial symptoms of the infants were disturbance of digestion (diarrhea, vomiting, and anorexia), involvement of the respiratory tract, fever, anemia, pigmentation of the skin, and enlargement of the liver. The cause was arsenic-contaminated dried milk. The condition of the infants is described, as well as the results of various examinations and symptoms.

39944 **APTIC NO. 61054**

Nagai, H., T. Usui, A. Asahi, M. Takada, Z. Takenaka, H. Tomura, S. Miki, K. Koike, S. Hayakawa, and H. Wada

COMPARISON OF BIOCHEMICAL FINDINGS AND CLINICAL PICTURES ON SUBACUTE OR CHRONIC ARSENIC POISONING OF INFANTS DUE TO ARSENIC-CONTAINING POWDERED MILK. *(Hiso konnyu funnyu ni yoru nyuji akyusei naishi mansei hiso chudoku no seikagakuteki shoken to rinshozo tono taihi). Shonika Kiyo (J. Paediatr.), 2(2), 1955. 37 refs. Translated from Japanese, 41p.*

The arsenic poisoning of infants who drank arsenic-containing powdered milk is discussed. Previous cases of arsenic poisoning, toxicity of arsenic derivatives, and determination methods for arsenic are reviewed. Arsenic can be determined by the Reinsch test, the Gutzeit method (a modified method by Goldstone), the molybdenum blue method, bromate method, iodometric method, colorimetric method, and polarography. When the infants were divided into two groups, one having taken in more than 10 mg/kg and the other less than 4.9 mg/kg of arsenic, the clinical symptoms were correlated with the amount of arsenic intake. The arsenic concentration in the blood of the affected infants was almost always above 0.3 gamma/g, reaching a maximum of 3.1 gamma/g. This compares with approximately normal concentrations of 0-0.3 gamma/g. The amount of arsenic in the urine, clinical symptoms, amount of arsenic in feces, and the relation between the amount of arsenic intake and discharge and clinical symptoms are reviewed. The amount of arsenic in the hair of normal infants appears to be 0-50 gamma/100 g; in 22 of the 24 studied cases of poisoned infants, the amount of arsenic in the hair was more than 1 mg/100 g, with a maximum of 10 mg. The amount of arsenic in hair correlated well with the seriousness of clinical symptoms. The relationships between the symptoms and werum protein, serum sulfhydral group, amount of arsenic in vesicated blister fluid, concentration of sodium and potassium in serum, and 17 KS in urine are reviewed. The behavior of serum-SH, Na and K in serum, and 17 KS in urine of poisoned infants indicated that arsenic poisoning affected the adrenal glands. Therefore, the relation between arsenic poisoning and adrenals and the pituitary body, as well as the mechanism for generating pigmentation during arsenic poisoning are discussed.

39945 **APTIC NO. 61057**

Nagai, Hideo, Rokuro Okuda, Hiroshi Nagami, Atsuyuki Yagi, Chuzo Mori, and Hisakazu Wada

SUBACUTE-CHRONIC ARSENIC POISONING IN INFANTS -- SUBSEQUENT CLINICAL OBSERVATIONS. *(Nyuji ni mirareta akyusei naishi mansei hiso chudoku -- Sono go no rinsho kansatsu). Shonika Kiyo (J. Paediatr.), 2(3):124-132, 1956. 25 refs. Translated from Japanese, 29p.*

The progress of patients who were poisoned by arsenic in powdered milk is reviewed. As of Nov. 24, 1955, 134 infants suffered from arsenic poisoning; six were being hospitalized, 119 were being given outpatient treatment, eight did not come to the hospital, and one died due to causes other than arsenic poisoning. Among the 134 cases there were 12 cases displaying abnormal findings -- 10 cases with liver changes, one with blood changes, and one with nail abnormalities. By Dec. 1955, six of these abnormal patients had improved and were discharged and two still had abnormal liver functions but were discharged. Among the 53 cases with clear records, arsenmelanosis disappeared in 1 mo in 5% of the cases, after 1 to 2 mo in 53%, after 3 to 3 mo in 36%, and after 3 to 4 mo in 5%. White spots and desquamation symptoms disappeared within 1 mo in 7% of the cases, after 1 to 2 mo in 56%, after 2 to 3 mo in 29%, after 3 to 4 mo in 6%, and after 6 to 7 mo in 1%. Abnormalities to nails disappeared in 1 mo in 8%, after 1 to 2 mo in 37%, after 2 to 3 mo in 42%, and after 3 to 4 mo in 12% of the cases. When body weight distribution was studied between Nov. 1955 and March 1966, of the 79 cases, 66% were within the normal range, while 23% were above and 11% were below. Results are given on clinical tests given to the infants, including electrocardiograms, electroencephalograms, liver function tests, adrenal function tests, measurements of arsenic in the blood, and bone x-ray findings. Electrocardiograms had returned to normal within 3 mo. Liver functions had returned to normal within 4 mo except for three or four cases. No abnormal electroencephalogram findings were observed. The abnormalities of melanosis, white spots, desquamation, nail, and hair disappeared after 3 to 4 mo. As a whole the patients made good progress and clinically were almost cured. Some shifts in the long bone epiphysis improved, others were unchanged.

Some long bones displayed retardation of growth in the lengthwise direction.

39946 **APTIC NO. 61050**

Okamura, K., T. Ota, K. Horiuchi, H. Hiroshima, T. Takai, Y. Sakurane, and T. Baba

SYMPOSIUM ON ARSENIC POISONING BY POWDERED MILK (2). *(Shinpojiumu-konkai no funnyu ni yoru hiso chudokusho ni tsuite (2)). Shinryo (Diagn. Ther.), 9(2):240-249, 1956. Translated from Japanese, 29p.*

The outbreak of arsenic poisoning of infants due to arsenic-contaminated powdered milk is reviewed. Clinical observations were made on 93 infants. Of infants who drank three of less cans, 14% had symptoms, 62% drinking four or more cans had symptoms, 91% drinking 16 cans, and 100% above 20 cans. The symptoms included liver enlargement, pigmentation, anemia, fever, diarrhea, emaciation, anorexia, vomiting, loss of temper, exanthema, and loss of hair. Tests of liver function showed that one out of 13 cases had slight liver malfunctions. Serum protein partition, hemoglobin content, ophthalmological tests, erythrocyte count, leukocyte count, neutrophilic leukocytes, lymphocytes, eosinophilic leukocytes, bone x-rays, electrocardiograms, and other tests were used to study the infants. The infants were treated with BAL, vitamins, methionine, and other drugs. BAL and yakriton antidotes seemed to be the most effective treatments. In another study, the changes of the skin of infants affected by arsenic poisoning were examined. The infants developed chronic poisoning rashes and the two major symptoms: arsenmelanosis and arsenkeratosis. The former occurred in 11 out of 13 hospitalized patients observed dermatologically. Autopsies were performed on four infants. Findings are described for the skin, medullary muscle, thorax, mediastinum, thymus gland, pericardium, heart, lungs, abdominal cavity, spleen, kidney, urethra and urinary bladder, oral cavity, alimentary canal, stomach, intestines, pancreas, thyroid gland, adrenals, pituitary body, central nervous system, bone system, medulla, lymphatic tubercle, aorta, and reproductive organs.

39947 **APTIC NO. 61051**

Okamura, K., T. Ota, K. Horiuchi, H. Hiroshima, T. Takai, Y. Sakurane, and T. Baba

SYMPOSIUM ON ARSENIC POISONING BY POWDERED MILK. *(Shinpojiumu- konkai no funnyu ni yoru hiso chudokusho ni tsuite). Shinryo (Diagn. Ther.), 9(2):155-162, 1956. 16 refs. Translated from Japanese, 20p.*

The poisoning of children by arsenic-contaminated powdered milk is reviewed. From May to August 1955, approximately 3000 infants were affected. The numbers of patients with positive and negative results on the urine test, white and red blood cell counts, hemoglobin results, ages and sex of patients, consumption of dried milk, and numbers of patients with serious, medium, mild, and no symptoms are presented. According to polarography, the dried milk contained 0.011-1.625 mg% arsenic, by the Gutzeit method 0.15-1.0 mg%, and by 84 other tests with the Gutzeit method 0.16-6.2 mg% (3.19 mg% average). About 5/7ths of the users of the milk had recognizable symptoms. To determine arsenic toxicity, the limit of normal arsenic content must be determined. Healthy adults contained 0-22 micrograms g/100 g As in Japan and 8.3 and 9.4 micrograms/100 g in foreign countries. In the urine, normal values were determined as 0-850 and 0-690, micrograms/day, 106 g/l, and an average of 141 micrograms/l. The arsenic content in the dried milk was determined for the different months and found to vary. Manganese and lead in the milk was also determined. In 15 hospitalized infants, most arsenic blood concentrations were normal after As intake had been cut off for some time. Large amounts of As were found in the urine, small amounts were found in feces, and ten times more was found in hair than normal. Corpses of infants poisoned by the dry milk had a large amount of As in the liver. The patients were treated with BAL, which caused excretion of the As. The bones of affected infants were x-rayed. Shadows occurred in the bones of the diaphyses. Of 51 patients, 14 had slightly amplified epiphysis lines.

39948 **APTIC NO. 61058**

Tokanehara, Shigeru, Satoshi Akao, Sohei Tagaya, Seiichiro Akiyama, Toshihiko Kajiyama, and Sadashi Miyakawa

BLOOD FINDINGS IN INFANTILE ARSENIC TOXICOSIS CAUSED BY POWDERED MILK. *(Funnyu ni yoru nyuji hiso chudokusho no ketsueki shoken). Shonika Rinsho (Japan. J. Pediat.), 9(12):60-166, Dec. 1956. 2 refs. Translated from Japanese, 20p.*

Test results of the blood of infants who were poisoned by arsenic in powdered milk are reviewed. The babies were given BAL or a cystine preparation (glucuronic acid, thiosulfate sodium, and Periston-N), blood transfusions, antilipotropic substances, and vitamins as therapeutic measures. During the first examination, most of the patients had erythrocyte counts of less than 4,000,000. With therapy, there was gradual improvement, and complete recovery of the erythrocyte system was seen in about 4 mo. At the time of the first examination, there were decreases in the peripheral leukocyte count, in the numbers of neutrocytes and lymphocytes, and increases in the nuclear shadows in the granule cell system. Thus, destruction of the leukocytes was taking place in the peripheral blood. In the bone marrow, obstacles to maturation in the neutrocytes were observed, and there were decreases in the lymphocytes. One month after therapy, a state of irritation occurred in the peripheral blood, but this returned almost to normal in about 4 mo. In the thrombocyte and megakaryocyte systems, remarkably low values were seen in the thrombocyte counts because of destruction of the thrombocytes in the peripheral blood and impaired capacity of the megakaryocytes to form thrombocytes. About 1 mo after therapy began, there was amost complete recovery in the thrombocyte counts, but in some cases there were increases after about 4 mo. Thus, the blood findings can be interpreted in terms of destruction of various types of cells in the peripheral blood, expulsion and emigration of juvenile cells from the bone marrow, obstacles to maturation of the various types of blood cells in the bone marrow, and atrophy of the lymphopoietic apparatus.

1955

39949 **APTIC NO. 61056**

Eiji, Hamamoto

INFANT ARSENIC POISONING BY POWDERED MILK. *(Funnyu ni yoru nyuji hiso chudokusho). Nihon Iji Shinpo (Japan Med. J.), no. 1649:3-12, Dec. 3, 1955. Translated from Japanese, 38p.*

From August to October 1955, 9718 infants who drank dry milk were afflicted with arsenic poisoning and 62 of them died. The background of the incident and the diagnosis of arsenic poisoning are described. Symptoms included anemia, fever, diarrhea, vomiting, coughing, jaundice, malanosis, melanosis of the skin, and liver swelling. Most (52.4%) of the infants were 6 to 11 months of age. Males outnumbered females significantly. Severe cases were defined as having intense melanosis, large and hard liver swelling, and anemia with an erythrocyte count of 2,500,000, hemoglobin of 40%, and leukocyte count of 4000 or less. The criteria for medium cases were medium-degree melanosis and liver swell and anemia with an erythrocyte count of 3,000,000, Hb of 50%, and leukocyte count of 5000 or less. The criteria for the light cases were slight melanosis, liver swelling, and anemia. The relative severity of symptoms such as fever, heart trouble, electrocardiogram findings, and edema were also considered. The injection of BAL was used as the therapy; it was very successful, and caused few side effects. Since the arsenic-tainted dry milk contained about 1.5-2.4 mg of arsenic/100 g of powdered milk, the amount of arsenic ingested would be 1.3-3.6 mg/infant if the infant ingested 90-150 g of powdered milk a day. It is therefore quite understandable that poisoning symptoms should appear; it even appears that this quantity is quite close to the acute toxic dosage.

39950 **APTIC NO. 61053**

Kitamura, N. and T. Kasuyama

ARSENIC POISONING DUE TO MORINAGA M.F. DRIED MILK. 1. ARSENIC CONTENT IN M.F. DRIED MILK. *(Morinaga dorai miruku M.F. ni yoru hiso chudoku ni tsuite. M.F. jirushi funnyu chu no hiso ganyuryo ni tsuite). Okayama-ken Eisei Kenkyusho Nenpo (Ann. Rept. Hyg. Lab. Okayama), no. 6, 1955. Translated from Japanese, 4p.*

To find the cause of a mysterious disease among artificially fed infants, dried milk was tested for arsenic contamination. In the first test, 2.5-2.8 mg of arsenic oxide/100 g of milk was detected. The arsenic content in different samples varied according to manufacture date. For example, it was 4-5 mg/100 g on April 25, 1955, 2.3 mg on April 13, 3.2 mg on April 21, 2.7 mg on May 2, none from May 6 to May 11, 5-6 mg in late May, and 2.4-4 mg in June.

39951 **APTIC NO. 61052**

Kodama, J., N. Kitamura, and K. Inoue

ARSENIC POISONING DUE TO MORINAGA M.F. DRIED MILK. 2. ARSENIC CONTENT INSIDE THE BODY OF THE INFANTS AFFECTED WITH ARSENIC POISONING. *(Morinaga dorai miruku M.F. ni yoru kiso chudoku ni tsuite. Hiso chudoku nyuji no tainai ni okeru kysoryo ni tsuite). Okayama-ken Eisei Kenkyusho Nenpo (Ann. Rept. Hyg. Lab. Okayama), no. 6, 1955. 1 ref. Translated from Japanese, 8p.*

The arsenic poisoning incident due to dried milk manufactured by the Morinaga Milk Industry, Inc. was studied. Additives used in the manufacture of dried milk, sodium phosphate used as a stabilizer, arsenic content in the organs of infants who died from this poisoning, and arsenic content in body fluids, excretions, hair, and nails of the infants being treated were determined. Arsenic (7.11%) was detected in the sodium phosphate stabilizer; this was considered to be the cause of the poisoning. The greatest amounts of arsenic in the infants who died were detected in livers, followed by kidneys, small intestines, and bones. The amounts were quite small. In treated infants, the greatest amounts of arsenic were in hair and nails. A special relationship between arsenic and hair gave useful data in judging arsenic poisoning. Only a small amount of arsenic was detected in the urine. Considering the fact that arsenic is excreted in the urine via the kidney, the timing of the collection of samples could have been too late. There was only one case of a slight arsenic detection in the feces; none was detected in blood, spinal fluid, sweat, tears, or saliva.

EFFECTS-PLANTS AND LIVESTOCK

1974

39952 **APTIC NO. 62108**

Arikado, H., T. Taniyama, T. Watanabe, and S. Sano

GENERAL STUDIES ON THE CIRCULATION OF POLLUTANTS IN ECOLOGICAL SYSTEMS OF AGRICULTURE, FORESTRY, AND FISHERIES. THE INDEX ORGANISMS (PART II): THE LIMIT OF TOLERANCE OF INDEX ORGANISMS IN THE ENVIRONMENT OF AGRICULTURE, FORESTRY, AND FISHERIES, AND THEIR UTILIZATION. *(Norin suisan seitaikei ni okeru osen busshitsu no junkan to shihyo seibutsu ni kansuru sogo kenkyu. II: Norin suisan kankyo ni okeru shihyo seibutsu no taisei genkai to sono riyo). Text in Japanese. Mie Univ. (Japan). Research Inst. of Crops, 17p., March 1974. 3 refs.*

The selection of plant indicators for air pollution in agricultural areas of Yokkaichi is discussed. The effects of various air pollutants on the photosynthesis of rice and corn plants were studied experimentally, and the results of the actual field study of plant damages in Yokkaichi are given. Plant damages occurred in decreasing order to gladioli, Hosta, buckwheat, sesame, and morning glories, and there was a significant correlation with air quality measurements for the first three plants, showing their applicability as plant indicators. Photosynthesis in rice was more susceptible to air pollution than in corn, and it showed a faster rate of damage with greater severity to ozone, sulfur dioxide, chlorine, and nitrogen dioxide. Cumulative experiments with O3, NO2, and carbon monoxide were carried out in concentrations of 0.5-10.0 ppm. The rice harvest was reduced 21% as compared to 35% in 1972, probably because of the reduction in the aerial concentrations of SO2. Specific plant damages include nonseasonal reddening of the leaves.

39953 **APTIC NO. 62878**

Creed, E. R.

TWO SPOT LADYBIRDS AS INDICATORS OF INTENSE LOCAL AIR POLLUTION. *Nature (London), 249(5455):39-392, May 24, 1974. 9 refs.*

Ladybirds (ladybugs) which are black with red spots are more frequently found in polluted areas than those which are red with black spots. A sample of 95 ladybirds in the Cynon valley of Wales had 53.7% black ladybirds. This area is polluted by a smokeless fuel phunacite plant. The sample from the village of Abercwmboi had 41.5% melanics; this areas was roughly the same distance from the smokeless ovens as the first sample, but to the west of them. Melanic frequency fell with increasing distance from the ovens. Other samples in various areas of Wales also showed a correlation between the number of black ladybirds and the amount of pollution. Tree damage was caused near the phurnacite plant by sulfur dioxide and smoke. The melanic frequencies seemed to be an effect of gases other than SO2 or of the particulate matter comprising grit and smoke.

39954 **APTIC NO. 62546**

Fowler, D. and M. H. Unsworth

DRY DEPOSITION OF SULPHUR DIOXIDE ON WHEAT. *Nature (London), 249(5455):389-390, May 24, 1974. 8 refs.*

An extensive series of measurements of dry deposition rates of sulfur dioxide on a field of winter wheat were measured and factors which may limit the deposition rate are discussed. Measurements were made over 1- or 2-hour intervals during the period from June 8 until August 12, 1973. The annual SO2 deposition was about 47 kg/ha. Surface wetness had a major influence on dry deposition rates. The surface resistance is the controlling step in deposition to vegetated surfaces. The dry deposition rates of SO2 may be considerably enhanced in the winter when surfaces are wet for long periods.

39955 **APTIC NO. 62525**

Fukuda, H. and K. Terakado

SPECIFIC FEATURES OF THE DAMAGE OF MORNING GLORY DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu ni yoru asagao higai no tokucho). Text in Japanese. In: Tokyo Nogyo Shikenjo Sokuho, p. 33-34, Feb. 1974.*

Although the phenomenon of damage of morning glory due to photochemical smog has been known, no fundamental investigations have been carried out concerning the relationships between the concentration of the photochemical smog, the onset, and degree of the damage, those between leaf age and damage; and the physiological and the metabolic change due to exposure to photochemical smog. The relationship between the damage index and the concentration and duration of the photochemical smog was investigated in order to test the morning glory as a plant indicator. The plant was exposed to the pollutant in the lab from Aug. 16 to Sept. 21, 1973. The results of nine experiments were: toxic threshold value was 8 pphm for 3 hr of exposure; the necrotic threshold values were 8 pphm for 9 hr, 9 pphm for 6 hr and 10 pphm for 5 hr of exposure. When the injured leaf area was directly used as the index of damage (except necrosis), the highest correlation was to the cumulative concentration. Plant growth was affected, and the age of the leaves showed different levels of susceptibility. Morning glory is appropriate for use as a plant indicator, but species specific toxic tolerances must be taken into account.

39956 **APTIC NO. 62526**

Fukuda, H. and K. Terakado

ON THE DAMAGE OF PLANTS DUE TO PEROXYACYL NITRATES (PAN). *(PAN ni yoru shokubutsu higai ni tsuite). Text in Japanese. In: Tokyo Nogyo Shikenjo Sokuho, p. 35-36, Feb. 1974.*

Peroxyacyl nitrates (RCOOONO2) formed by the photochemical reaction between hydrocarbons and nitrogen oxides in polluted air give specific damages such as silvering and bronzing to plants at a very low concentration. In Japan the plant damages began to resemble those due to PAN from about 1972. Exposure experiments with artificially synthesized PAN in an environment simulation room determined the concentration of PAN and its duration to examine the relationship between these data in fields and the crop damage. Synthesized PAN created by irradiating a mixutre of ethyl nitrate and oxygen with ultraviolet light gave results similar to those seen in fields. From the end of April to the end of Nov., damages to petunias seemingly due to PAN appeared 15 times. The symptoms differed by the variety of petunia. After 14 experiments in fields from Sept. 20 to Nov. 30 with a continuous determination of the environmental concentration of PAN, damages to petunia were confirmed on 6 days when the maximum PAN concentration range was 3.0-6.7 ppb. The duration of concentrations higher than 3 ppb was 2-13 hr. The most serious damage appeared on Sept. 20 when a concentration of more than 5 ppb continued for 7 hr. No damage appeared with a long continuation (6-12 hr) of a lower concentration of PAN of 2 ppb. Inter-varietal grafting showed that the symptoms and the degree of damage due to PAN were influenced only by the physiological specificity of aerial portion of the plant. Leaves which are most affected by PAN differed with the variety of petunia.

39957 **APTIC NO. 62597**

Garrec, J. P., J. C. Oberlin, E. Ligeon, A. M. Bisch, and A. Fourcy

FLUORIDE-CALCIUM INTERACTION IN POLLUTED FIR NEEDLES. *Fluoride, 7(2):78-84, April 1974. 12 refs.*

The fluoride-calcium interaction was investigated in the leaf tissues of fir needles growing in a polluted area. The fluoride and the Ca distribution were established in relation to the effect of fluoride on the chemical forms of Ca. Simultaneous determination of fluoride and Ca by proton microanalysis revealed a simultaneous accumulation in the injured tip, and a large increase in the Ca level throughout the polluted needles. The ratio of the chemical forms of Ca also changes with the accumulation of fluoride; Ca oxalates particularly show an increase. There is a parallel deposition of fluoride and Ca in polluted needles which suggest precipitation of calcium chloride. The largest amounts of Ca and fluoride in equal proportions are localized in the injured area. This localization in the tips suggests a direct relation between the possible precipitation of CaF2 and apical necrosis. The relationship also suggests that formation of CaF2 represents either a mode of inactivation of the halogen or a disturbing factor in the cellular equilibrium of Ca. (Author summary modified)

39958 **APTIC NO. 62391**

Hampp, R. and K. Lendzian

EFFECT OF LEAD IONS ON CHLOROPHYLL SYNTHESIS. *Naturwissenschaften (Berlin), 61(5):218-219, 1974. 7 refs.*

Seeds of Avena sativa L. were grown in the dark in wet vermiculite at 22 C. When the seedlings were 16 days old the primary leaf was cut into pieces 1 cm long and 0.5 g of these leaf pieces were put in 25-milliliter Erlenmeyer flasks in 10 ml glycylglycine with and without lead chloride and preincubated in the dark for 1 hr. The flasks were held for 72 hr at 21 C in a water bath, illuminated at 7000 lux, and shaken 40 times a minute. Chlorophyll was extracted in 80% acetone and the content of chlorophyll a and chlorophyll b determined as per Ziegler and Egle. Synthesis of both types of chlorophyll was reduced in proportion to the increasing amounts of lead ions. Even concentrations as low as 50 micromoles PbCl2 had a statistically significant effect. At lower concentrations (0-500 micromoles), synthesis of chlorophyll b was inhibited to a greater extent than that of chlorophyll a; at higher concentrations the ratio of chlorophyll a to chlorophyll b was balanced.

39959 **APTIC NO. 62523**

Iijima, T.

SUITABILITY OF SEVERAL AGRICULTURAL PLANTS AS INDICES OF PHOTOCHEMICAL OXIDANTS. *(Sushu nosakumotsu no kokagaku okishidanto shihyosei). Text in Japanese. In: Tokyo Nogyo Shikenjo Sakuho, p. 28-29, Feb. 1974.*

Toxic tolerances and thresholds for various plants were investigated in order to select appropriate air pollution indices. Injuries possibly due to air pollution were recognized microscopically on 53 varieties of 25 species of 12 famiies of plants raised in natural and controlled conditions. Ninety per cent of the injuries were due to oxidants. Spinach, french beans, and swiss chard were susceptible to peroxyacyl nitrate damages. Suitable plant indicators for oxidants, ozone, and PAN were chosen for their high susceptibility to the pollutants, ease of cultivation, and visibility of damages.

39960 **APTIC NO. 62387**

Lerche, H. and S.-W. Breckle

LEAD IN THE ECOSYSTEM BORDERING HIGHWAYS. *Blei im Oekosystem Autobahnrand). Text in German. Naturwissenschaften (Berlin), 61(5):218, 1974. 9 refs.*

Examination of native trees along highways has revealed a strong gradient of lead concentration depending on proximity to the street and traffic density. The various species of trees displayed different retention capacities for lead. In Carpinus butulus the lead concentration of the leaves dropped 1/4 at a distance 150 m from the highway, and Picea after 50 m. Lead retention was influenced by leaf morphology and the weather conditions. Of the retained lead 50 to 80% can be washed off by water. At 5 m from the highway carpinus butulus measured 595 ppm Pb, quercus robur 320 ppm, and picea abies 91 ppm.

39961 **APTIC NO. 62871**

Nikolayevskiy, V. S. and A. T. Miroshnikova

THE AIR POLLUTION LEVELS PERMISSIBLE FOR PLANTS. *(Dopustimyye normy zagryazneniya vozdikha dlya rasteniy). Text in Russian. Gigiena i Sanit., no. 4:16-18, 1974. 15 refs.*

The photosynthesis-inhibiting effect of different gaseous and particulate air pollutants in cut-off branches from 8 different tree species was studied to establish maximum allowable pollutant concentrations for plants. As a permissible pollutant concentration, that which for a period of 5 min produces no noticeable decrease in the photosynthesis of any of the 8 species with different resistances was taken. The permissible standard levels of air pollution proved to be lower for plants than for animals. The maximum allowable concentrations were 0.02

mg/cu m for sulfur dioxide; 0.05 mg/cu m for nitrogen oxides; 0.1 mg/cu m for ammonia and sulfuric acid mist; 0.02 mg/cu m for formaldehyde; 0.2 mg/cu m for methanol; 0.1 mg/cu m for benzene, 0.2 mg/cu m for cyclohexane, and 3 mg/cu m for urea and sodium sulfate.

39962 **APTIC NO. 62875**

Ricks, G. R. and R. J. H. Williams

EFFECTS OF ATMOSPHERIC POLLUTION ON DECIDUOUS WOODLAND. PART 2: EFFECTS OF PARTICULATE MATTER UPON STOMATAL DIFFUSION RESISTANCE IN LEAVES OF QUERCUS PETRAEA (MATTUSCHKA) LEIBL. *Environ. Pollut., 6(2):87-109, Feb. 1974. 25 refs.*

Stomatal diffusion resistance of leaves of Quercus petraea (oak leaves) in an area of deciduous woodland subjected to a differential gradient of particulate pollution was measured. Accumulation of particles on the lower surfaces of leaves interfered with normal stomatal behavior and, as a result, maximal diffusion resistance measured at night was considerably lower than that measured at an unpolluted rural site. The magnitude of the reduction in the maximal diffusion resistance at night was related to the proportion of stomata that had their pores partially occluded by particles. The effects upon gas exchange in the leaves were also examined. Overall rates of water loss were not seriously increased by the reduction in diffusion resistance at night, but uptake of gases such as sulfur dioxide was enhanced. (Author abstract)

39963 **APTIC NO. 61843**

Saeki, M., K. Kunii, S. Izumida, and T. Kumagaya

STUDIES ON THE DETERMINATION OF AIR POLLUTION UTILIZING LICHENS AS INDEX. PART I: ON THE LICHENS GROWING ON TOMBSTONES IN SENDAI CITY AND ITS SURROUNDINGS. *(Chii-rui o shihyo to suru taiki osen no sokutei ni kansuru kenkyu - Sendaishi oyobi shuhen no hakaishi ni chaku-sei suru chii-rui ni tsuite (dai 1 ppo)). Text in Japanese. Sendaishi Koshu Eisei Kenkyu Gyosekishu (Japan), p. 139-141, March 1974.*

To determine air quality in Sendai city, lichens on tombstones in six cities were examined. Eighteen species of leafy lichens were used as plant indicators because of ease of identification and differing toxic tolerances of some species within a genus to air pollution.

39964 **APTIC NO. 61844**

Saeki, M., K. Kunii, S. Izumida, and T. Kumagaya

STUDIES ON THE DETERMINATION OF AIR POLLUTION UTILIZING LICHENS AS INDEX. PART II: RELATIONSHIP BETWEEN LICHENS AND AIR POLLUTION IN SENDAI CITY. *(Chii-rui o shihyo to suru taiki osen no sokutei ni kansuru kenkyu - Sendaishi ni okeru chii-rui to taiki osen tono kanren ni tsuite (dai 2ho)). Text in Japanese. Sendaishi Koshu Eisei Kenkyu Gyosekishu (Japan), p. 142-145, March 1974.*

Lichens were used to evaluate the air quality in the Sendai industrial seaport. Lichens on trees at seven monitoring points within 4-10 km along the seashore and lichens on tombstones within a 10 km radius around Sendai city were studied. The lichens were evaluated according to their health and susceptibility to air pollution damage. There was a high correlation between air quality measurements taken by instrumentation and information deduced from the plant indicators.

39965 **APTIC NO. 62534**

Severne, B. C.

NICKEL ACCUMULATION BY HYBANTHUS FLORIBUNDUS. *Nature (London), 248(5451):807-808, April 26, 1974. 17 refs.*

Studies of nickel accumulation by Hybanthus floribundus, an Australian shrub species which accumulates nickel and cobalt with modal levels of 5000 ppm and 100 ppm, respectively, in leaf tissue are reviewed, and a possible mechanism for the accumulation of nickel by this plant is proposed. Pearson product moment coefficient data are presented and indicate an inverse nickel-calcium relationship, suggesting a substitution mechanism which is supported by recent findings of nickel in pectinates. Accumulation of nickel in epidermal tissue of Hybanthus floribundus has been clearly demonstrated, but there is no evidence for a disposal mechanism, thus raising the question whether nickel is required by the plant. A mechanism is proposed whereby epidermal accumulation of nickel, where concentrations probably approach 5% or more (fresh weight), reduces cuticular transpiration and that nickel accumulation by the plant is a xeromorphic adaptation.

39966 **APTIC NO. 62107**

Sugiyama, K.

EXAMINATION AND UTILIZATION OF THE SUSCEPTIBILITY OF LOWER PLANTS, ESPECIALLY LICHENS AS INDICES OF AIR POLLUTION. *(Kato shokubutsu tokuni chii-rui no taiki osen shihyosei no kento to sono riyo). Text in Japanese. Shizuoka Univ. (Japan), Dept. of Biology, 16p., March 1974. 5 refs.*

Lichens were collected and identified as to their susceptibility to air pollution damage in order to choose suitable plant indicators. Urban graveyards have abundant lichens on the tombstones and most urban graveyards are distributed with a density appropriate to the population of the area. Eighteen genera with 34 species of lichens were collected and identified. The geographical distribution of these lichens was compared to the geographical distribution of sulfur dioxide and a species-specific relationship was found. Parmelia tinctorum was the most appropriate index of pollution because of its easy identification, broad distribution, and moderate susceptibility. Geographical distributions of P. tinctorum and air quality measurements of SO2 were compared in nine cities. The lichen disappeared in the center of the cities and its growth was poor in areas where SO2 concentrations were more than 0.5-1.0 mg/day/100 sq cm (20-40 ppb).

39967 **APTIC NO. 61933**

Taniyama, Tetsuro, Toru Watanabe, and Seiji Sano

STUDIES OF GAS DAMAGES ON PRODUCE; NO. 18: THE EFFECTS OF VARIOUS AIR POLLUTANTS ON PHOTOSYNTHESIS OF RICE PLANTS AND CORN. *(Sakubutsu no gasu shogai ni kansuru kenkyu. Dai 18 po. Kakushu taiki osen busshitsu ga suito oyobi toumorokoshi hikari gosei ni oyobosu eikyo). Text in Japanese. Preprint. Crop Science Society of Japan, p. 83-84, 1974. (Presented at the Crop Science Society of Japan Lecture, Meeting, 15th, April 3-4, 1974.)*

Air pollutants including ozone, sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, and chlorine were used for the studies. The leaf temperature of the rice and corn plants was set at 30 C and the light intensity was 53 klux. The pollutants prevented photosynthesis of both plants in general. However, Cl2 at 1 ppm promoted the photosynthesis of both plants, while CO promoted that of rice plants at 0.5 ppm and that of corn plants at 10 ppm. In general, rice plants were more sensitive than corn plants in terms of photosynthetic prevention. For 30 to 60 min exposures to 0.5 ppm of the pollutants, rice plants recieved the highest prevention rate from O3, which was followed by SO2, NO2, Cl2, NO, and CO. At 1.0 ppm concentrations, the order of Cl2 and NO reversed.

39968 **APTIC NO. 62548**

Wallis, W. J., G. W. Miller, M. Psenak, and J. Shieh

FLUORIDE EFFECTS ON CHLOROPHYLL BIOSYNTHESIS IN NICOTIANA TABACUM. *Fluoride, 7(2):69-77, April 1974. 30 refs.*

The effects of chlorine and fluorine on the biosynthesis of chlorophyll were investigated in Nicotiana tabacum. The effect at different concentrations (0.0001 M, .001, and .01 M) was investigated on the incorporation of 14 Carbon-delta- aminoleuvulic acid (ALA) into coproporphyrin and protoporphyrin fractions, and ether-extractable pigments (chlorophyll a and pheophytin a) in tobacco leaf discs. Both chloride and fluoride at concentrations of .0001 to .01 M inhibited the incorporation of ALA into chlorophyll a and phelophytin a. At 0.01 M the effect of fluoride on AIA incorporation was greater than that of chloride. The inhibition on formation of phelophytin a by fluoride was similar to that found in chlorophyll a, indicating an effect on synthesis of chlorophyll rather than degradation. The effect of fluoride on individual enzymes in the chlorophyll biosynthetic pathway is discussed in relation to the action of fluoride on cellular ultrastructure. (Author summary modified)

39969 **APTIC NO. 61726**

Will, J. B. and J. M. Skelly

THE USE OF FERTILIZER TO ALLEVIATE AIR POLLUTION DAMAGE TO WHITE PINE (PINUS STROBUS) CHRISTMAS TREES. *Plant Disease Reptr., 58(2):150-154, Feb. 1974. 12 refs.*

The use of fertilizer to alleviate air pollution damage to white pine (Pinus strobus) Christmas trees was investigated over a 2-year period. Elimination of air pollution symptoms on Christmas trees is feasible through the use of a high nitrogen fertilizer. Fall application of 25-9-9 fertilizer reduced symptoms expressed as a burning or yellowing of the new needles. Four rates (1-4 cups, 8 oz each) were applied to trees of various heights, and a recommendation of rates based upon tree heights and symptoms was developed. (Author abstract modified)

39970 **APTIC NO. 62524**

Yoneyama, T., N. Date, and S. Kurihara

DAMAGES OF SOFT VEGETABLES DUE TO AIR POLLUTION. *(Nanjaku yasai- to no taiki osen higai). Text in Japanese. In: Tokyo Nogyo Shikenjo Sokuho, p. 30-32, Feb. 1974.*

Toxic tolerances and thresholds of vegetables to oxidants were investigated by comparing the oxidant concentrations from 48 hr before damages occurred to the degree of damage. Nine species of vegetables were classified into three groups according to their susceptibility to oxidant damage. Vegetables highly susceptible to oxidant damage begin to show damages at less than 40 pphm, species moderately susceptible at concentrations less than 80 pphm, and those resistant to oxidants at 120 pphm. The ratio of damages between susceptible and resistant species is 10:6. Seasonal variations were recognized, and the effects of the pH of the soil are noted.

1973

39971 **APTIC NO. 62109**

Arikado, H., T. Taniyama, and K. Sawanaka

ON THE SUSCEPTIBILITY OF INDEX ORGANISMS AND THE MECHANISM OF THEIR RESISTANCE TO AIR POLLUTANTS. *(Shihyo seibutsu no kanjusei oyobi teikosei kiko no kaimei). Text in Japanese. Mie Univ. (Japan), Research Inst. of Crops, 17p., March 1973. 4 refs.*

Investigations of actual plant damage due to air pollution in Yokkaichi pointed out plants appropriate for study as air pollution indicators. The effect of ai/r pollution on the growth and yield of rice was studied. Hosta, gladioli, peonies, iris, ginkgo, metasequoia, and osmanthus are suitable plant indicators. Growth of rice plants was retarded in polluted areas: leaves were affected after the ears appeared; the number of stems was smaller; leaves were narrower; and the dry weights of the stems, leaves, and roots were considerably less. The harvest of the rice was reduced 35%, with the most significant reduction appearing in the number of ears per plant. There was an inverse exponential functional reduction of total dry weight and total harvest, and the average concentration of sulfur oxides in the air.

39972 **APTIC NO. 62275**

Heagle, Allen S.

INTERACTIONS BETWEEN AIR POLLUTANTS AND PLANT PARASITES. *Ann. Rev. Phytopathol., vol. 11:365-388, 1973. 94 refs.*

The sources and effects on vegetation of sulfur dioxide, ozone, and fluorides are reviewed. Various fungus diseases differ in reaction to SO2. Sometimes SO2 decreases parasitism of fungi, which may at first appear to be a positive effect. However since the SO2 affects all forms of plant life, it is generally detrimental. While some fungi are resistant to SO2, SO2 can decrease fungus growth and spore germination. Field observations of the effects of O3 on fungi are rare. Laboratory and greenhouse studies show that O3 can decrease infection, invasion, and sporulation of fungi parasitic on growing plants. Ozone also decreases spore germination. Fluoride effects are minor compared to SO2, but may add to the effects attributed to SO2. There is some evidence these pollutants can affect bacteria, but most evidence concerns human pathogens. Both fluoride and O3 either predispose pinto bean leaves to tobac[illegible] mosaic virus infection or somehow increase the ineffectiv[illegible]ness of the virus particles. Trees weakened and injured [illegible] SO2 are more likely to be attacked by insects that normally require weakened trees for successful reproduction. But other studies have shown insects to be injured by SO2 and other pollutants. Parasitic disease may affect the development of O3 injury in some cases decreasing O3 injury.

39973 **APTIC NO. 62084**

Hodgson, Richard H., D. Stuart Frear, H. R. Swanson, and L. A. Regan

ALTERATION OF DIPHENAMID METABOLISM IN TOMATO BY OZONE. *Weed Sci., 21(6):542-549, Nov. 1973. 51 refs.*

The effects of ozone fumigation on the metabolism of diphenamid (N,N-dimethyl-2,2-diphenylacetamide) in the tomato was investigated and the metabolites were identified. Fumigation with low levels of O3 had little effect on root absorption, translocation, or conversion of diphenamid to water-soluble conjugates. However, the proportion of specific conjugates was markedly altered in O3-fumigated plants. Twenty-four hr after treatment, the predominant conjugates formed in nonfumigated and fumigated tomato were the beta-glucoside (MDAG) and the beta-gentiobioside (MDAGB), respectively of N-hydroxymethyl-N-methyl-2,2-diphenylacetamide. The ratio MDAG:MDAGB was 8.2:1.0 in the nonfumigated tissue and 0.6-1.0 in O3-fumigated tissue. This marked shift towards production of the more polar MDAGB was accompanied by a trend toward increased production of methanol insoluble residues. A compound having limited stability was extracted from tomato. Its probable structure was N-hydroxy-methyl-N-methyl-2,2-diphenylacetamide (MODA), and it is a postulated intermediate in the formation of MDAG and MDAGB from diphenamid. (Author abstract modified)

39974 **APTIC NO. 61940**

Impens, Robert

THE EFFECT OF AN ACCIDENTAL POLLUTION EPISODE ON THE VEGETATION IN THE ENGIS REGION. *(Effet sur la vegetation d une pollution accidentelle dans la region d Engis). Text in French. Ann. Mines Belg., no. 10:1157-1165, Oct. 1973. 11 refs.*

An episode of accidental air pollution due to the abrupt release of large quantities of sulfur dioxide from a sulfuric acid production plant in Engis in the Meuse Valley in Belgium, and the effects of the high SO2 concentrations on the vegetation in the surroundings are described. The pollution episode, associated with fog, lasted Sept. 5 to 6, 1972. The SO2 concentrations measured during the pollution episode at distances of up to 6000 m were in a range of 204-1067 micrograms/cu m. Considerable damages due to the high SO2 concentrations were observed. The damages manifested themselves in defoliation; interneural, apical, or marginal necroses; chlorosis, and malformations of the leaves. Allium porrum, Avena sativa, Arrhenaterum elatius, Betula verrucosa, Carpinus betulus, Cichorium endivium, Fragaria vesca, Lactuca sativa, Malus communis, Medicago sativa, Mercurialis annua, Stellaria media, and Trifolium spp. were among the most sensitive species, while such species as Buxus sempervivus, Chamecyparis spp., Clematis spp., Crataegus oxycantha, Ilex aquifolium, Ligustrum spp., Prunus laurocerasi, Robinia pseudoacacia, and Zea mays were fairly resistant to SO2. Acer spp., Allium cepa, Brassica spp., Cornus sanguinea, Dahlia spp., Fraxinus excelsior, Gladiolus spp., Larix europea, Petroselinum sativum, Pinus spp., Populus spp., Quercus pedonculatus, Rosa spp., and Tlia platiphyllos assumed an intermediary position between the sensitive and resistant species.

39975 **APTIC NO. 62141**

Kano, F.

EFFECTS OF OXIDANTS ON PHYSIOLOGICAL FUNCTION OF A SLIME MOLD, PART II. *(Nenkin no seiri kino ni oyobosu okishidanto no eikyo -dai 2 ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):431, Oct. 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

By using the double chamber method, the pressure required to arrest the protoplasmic streaming of slime mold, Physarum polycephalum, was measured to determine the motive force influenced by the exposure of the slime mold to ozone at 0.3-0.5 ppm. The change of respiration of the slime homogenate by the exposure of the slime mold to ozone was measured by oxygen electrode method. The motive force of the slime decreased by exposure to ozone and increased at the cessation of ozone exposure. The internal respiration of the homogenate of the slime and the consumption of oxygen after addition of the substrate succinic acid increased with exposure to ozone. The coefficient of metabolism of internal respiration was 9.5 and 13.6 microlitre/mg/hr, respectively, for the control and the ozone- exposed slime homogenate. After addition of the substrate, the addition of ADP made the respiration a little higher; however, the curve showing the relative concentration versus time was not seen, suggesting the absence of control ability of respiration. The reversible decrease of motive force of protoplasmic streaming by ozone exposure would be due to the disturbance of the glyolytic system. The effect of ozone on the slime mold were discussed from the connection or respiration and glycolysis.

39976 **APTIC NO. 62605**

Kitamura, Fumio, Kazuhiko Takahashi, and Yukiyoshi Kawajiri

STUDIES ON THE LEAF-COLOR CHANGES OF GARDEN TREES AND SHRUBS BY AIR POLLUTION. *(Taiki osen ni yoru zoen jumoku no yoshoku henka ni kansuru kenkyu). Text in Japanese. Tokyo Daigaku Nogakubu Engei Jikkensho Kenkyu Hokoku (Bull. Demigaroa Arbor. Fac. Agric., Univ. Tokyo), no. 6:16-12, Oct. 1973. 6 refs.*

The leaves of various species of garden trees and shrubs planted in both heavily polluted and lightly polluted areas were observed by naked eye and with a color meter to investigate leaf-color changes caused by air pollution. Color meter observations showed that lightness of color tended to diminish and depth of green and yellow color tended to decrease in places where air pollution was great. Leaf-color changes caused by air pollution was greatest in Euonymus japonicus and Ligustrum lucidum, followed by Ligustrum japonicum and Cinnamonum amphora. Color changes were not very clear in other species. No correlation was recognized between durability against pollution and degree of leaf-color change.

39977 **APTIC NO. 62527**

Kusaka, Shoji, Tamao Imai, and Fumiyuki Asakawa

THE INLAND SEA COAST ON-SITE INVESTIGATIONS OF VEGETABLE DAMAGES BY COMPLEX POLLUTION OF OXIDANTS AND SULFUR DIOXIDE (PART I). *(Setouchi engan ni okeru okishidanto aryusan gasuto fukugo osen ni yoru sasairui no genchi higai jittai chosa (1)). Text in Japanese. Hyogo Kenritsu Nogyo Shikenjo Gyomu Kotei, 1972 (Annu. Rep. Hyogo Prefect. Stn.), 1973:1-8, 1973.*

To examine the causes for the frequent produce damages along the coast of Inland Sea, various types of scallions were planted in Takarazuka, Akashi, and Takasago, and the growth, damages, and relationship with air pollution were examined. In all experiments, brownish-white tip burn from 5 to 20 cm long were noted. The discoloration and burn damages were more serious on old leaves, but the growth impairment was generally more prominent for younger scallions. The sulfur content in the plants were highest in the order of Takasago, Takarazuka, and Akashi. Especially in plants planted in June, the total sulfur content in new leaves increased drastically. The atmospheric sulfur dioxide concentration was generally low, but the level of pollution was highest in the order of Takasago, Takarazuka, and Akashi, and agreed with the sulfur content in scallion leaves. In Takasago, the number of hours with more than 0.05 ppm concentration was much longer than other cities. Oxidant concentration was generally less than 0.05 ppm, but the maximum figure exceeded 0.2 ppm. The level of oxidant pollution was greatest in the order of Akashi, Takarazuka, and Takasago, the reverse of SO2 pollution, but the length of time with more than 0.1 ppm concentration was the longest in the order of Takasago, Takarazuka, and Akashi. The effects of SO2 or oxidants could not be determined singly on the scallions. But a complex effect of low concentration SO2, oxidants, and various biological factors of growing plants was suspected.

39978 **APTIC NO. 62528**

Kusaka, Shoji, Tamao Imai, and Fumiyuki Asakawa

THE INLAND SEA COAST ON-SITE INVESTIGATIONS OF VEGETABLE DAMAGES BY COMPLEX POLLUTION OF OXIDANTS AND SULFUR DIOXIDE GASES (PART II). *(Setouchi engan ni okeru okishidanto, aryusan gasuto fukugo osen ni yoru yasairui no genchi higai jittai chosa (2)). Text in Japanese. Hyogo Kenritsu Nogyo Shikenjo Gyomu Kotei, 1972 (Annu. Rep. Hyogo Prefect. Agric. Exp. Stn.), 1973:11-16, 1973.*

Heavy damages of scallion leaves were reported in June 1972 in Himeji; air pollution damages were suspected and an on-site investigation was conducted. Soil and plant samplings were analyzed for sulfur content and pH, and air pollution data of the Himeji air pollution monitoring stations were examined. The weather between June 1-20 was mostly cloudy with variable amounts of sun, and temperature differences were strong. The 24-hour sulfur dioxide concentration averages were mostly less than 0.05 ppm, with some high concentrations of 0.10 ppm or more for various single measurements. The oxidant level was within 0.01-0.02 ppm in general for the period and there was no conspicuously high measurement anywhere. In the investigated area, the entire field of scallions had heavy tip burn, but no other produce were damaged. The soil pH ranged between 5.8 and 7.4, and the sulfur content in scallions was higher than produce in control areas. Damages were not likely caused by any single effect of oxidant or SO2.

39979 **APTIC NO. 62529**

Kusaka, Shoji, Tamao Imai, and Fumiyuki Asakawa

THE INLAND SEA COAST ON-SITE INVESTIGATIONS OF VEGETABLE DAMAGES BY COMPLEX POLLUTION OF OXIDANTS AND SULFUR DIOXIDE (PART III). *Text in Japanese. Hyogo Kenritsu Nogyo Shikenjo Gyomu Kotei, 1972 Annu. Rep. Hyogo Prefect. Agric. Exp. Stn.), 1973:18-12, 1973.*

The damages of scallions that occurred in Takarazuka in early October 1972 were examined on site. On October 3, a sudden change was noted on the leaves of scallions; the usual green color turned yellow and the leaves withered, finally turning silver-grey and dying. An examination of meteorological data and pollution data showed that between Sept. 27 and Oct. 3, the level of oxidant concentration was unusually high. Between Oct. 1 and Oct 3, the average between 9 am and 6 pm was over 0.1 ppm, with the maximum of 0.168 ppm. The product was exposed to an average of 0.1 ppm oxidants for at least 10 hr. The level of sulfur dioxide in the air did not change dramatically during this period, but it tended to be high during the day, with hourly averages of 0.065 ppm and 0.054 ppm on Sept. 28 and Oct. 1. The scallion damages were assumed to be the effect of oxidants.

39980 **APTIC NO. 62173**

Matsushima, Jiro

EFFECTS OF NITROGEN OXIDES ON PLANTS. *(Chisso sankabutsu no shokubutsu ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):234-242, Oct. 1973. 12 refs. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The effects of nitrogen oxides on plants in fields and in experimental greenhouses were discussed. No damages to rice, soy beans, sweet potatoes, sesame, tomatoes, eggplants, pimentoes, cucumbers, strawberries, and grapes exposed to 20 ppm of nitric oxide for 7 hr were noted. There was, however, decreasing photosynthesis of tomatoes at 3.1 ppm, and of oats and alfalfa at 0.6 ppm. Nitrogen dioxide damage is usually interveinal chlorosis, especially on just matured leaves. The resistance of plants to NO2 differs among species, varieties, and strains, depending also on experimental conditions. The more susceptible plants are petunia, morning glory, mimosa, Phasaorus, popula, artemicia, plantage, and American bidens which show visible damage to 13-15 ppm for 1 hr. Moderately susceptible plants are ageratum, salvia, zinnia, scindapsus, tomato, taro, pear, malus, grape, peach, zelkova, nerium, chickweed, and chenopodium which show visible damage at 13-15 ppm for 2-5 hr. Resistant plants are Satsuma-orange, ginkgo, osmanthus, camellia, black pine, chaemocyparis, and amaranthus. Generally speaking, plants are relatively more resistant to NO2 than to SO2. However, before showing visibile damage, NO2 gives physiological effects or inhibits growth which is recognized by the decrease of wet or dry weight and the decrease of nitrate-type nitrogen with the increase of total nitrogen. The uptake of 14CO2 by exposure to NO2 was far larger than by exposure to SO2, and the retained CO2 changed mainly to alanine and glutamic acid. Plant damage due to NO2 exposure was more severe in the dark than in the light. Synergism of NO2 and SO2 is frequently seen, and the damage of plants is larger when they are first exposed to SO2 and then to NO2 than when exposed to NO2 and then to SO2.

39981 **APTIC NO. 62437**

Matsushima, Jiro

INFLUENCE OF VARIOUS CHEMICALS ON SULFUR DIOXIDE GAS INJURIES AND ITS MECHANISM IN SATSUMA ORANGE. *(Onshu mikan no aryusan gasu shogai ni taisuru kakushu yakuzai no eikyo to sono sayo kisaku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 2(2):160-167, June 1973. 13 refs.*

Results are presented from studies on the influence of various chemicals on sulfur dioxide gas injuries to Satsuma orange trees. Bordeaux mixture promoted sulfur dioxide injuries in the form of fallen leaves and smoke-lesion leaves, probably due to the copper sulfate component of the spray. Difolatan and Dithane were safely used in place of Bordeaux mixture. The insecticide Fussol (monofluoroacetamide) and the transpiration retardant OED Green (oxyethylenedecosanol) decreased sulfur dioxide injuries. Chemicals which promoted photosynthesis such as glutathione and ascorbic acid tended to increase in injuries, while those which suppressed photosynthesis such as Fussol and Dithane decreased injuries.

39982 **APTIC NO. 61768**

Steenken, Folkhard

FOGGING EXPERIMENTS ON CULTIVATED PLANTS WITH LEAD SALTS FROM AUTOMOBILE EXHAUST GAS. *(Benelungsversuche von Nutzpflanzen mit Bleisalzen aus Autoabgasen). Text in German. Z. Pflanzenkrankh. Pflanzenschutz, 80(6):346-358, 1973. 18 refs.*

Fogging experiments with lead(II) salts contained in automobile exhaust gas as well as with lead nitrate and lead acetates showed on all tested plants very homogeneous lesions: on older leaves 2-3 days after the treatment with solutions greater than 100 mg Pb(II)/l blackish blisters are produced symmetrically distributed over the leaf blade (lamina). At these spots the cell walls, especially at the palisade layer contiguous to the respiratory cavity, are considerably thickned and blackened. These cells die. Underneath, however, a wound cambium is developed. These injury pictures correspond very much to those which are caused by ozone. On young leaves such blisters are missing. In most cases only the leaf tips are decolorized. Not totally developed leaves are less sensitive against Pb salts than older ones. Plants which are grown during winter in a greenhouse have a lower resistance against equimolar Pb solutions than the corresponding outdoor plants. The quantitative injury effect of the Pb salts depends furthermore on the concentration as well as their solubility resp. stability in water. Lead nitrate proved to be the most injuring substance. The longer the Pb salts react on the leaves the lower is the proportion of washable lead. Three days after the treatment 65%-70%, 21 days afterwards only 35-40% could be washed off with water, ethanol, or ether. But from a leaf of red cabbage 30 days after the application still 80-90% of the lead is removable with a watered sponge. Thirty days after the application approximately 3% of the total Pb is infiltrated through the stomata into the mesophyll. A translocation of the lead compounds from contaminated leaves into developing, uncontaminated organs (leaves, fruits) does not occur.

39983 **APTIC NO. 61834**

Taoda, H.

ON THE INFLUENCE OF AIR POLLUTION TO PLANTS AND THE METHOD OF ITS INVESTIGATION. *(Taiki osen ga shokubutsu ni ataeru eikyo to sono chosa hoho). Text in Japanese. Nihon Seitai Gakkai Shi (Jap. J. Ecol.), 23(2):81-89, April 1973. 20 refs.*

Sulfur dioxide, oxidants, and fluorine compounds are discussed in relation to plant damage, measurement methods, and synergism of SO2 and oxidants. Plant damage can be classified as chronic (invisible) and acute (visible). The main symptoms of plant damages are described. Plant indicators must be chosen by their specific susceptibilities to air pollution.

39984 **APTIC NO. 61956**

IMPACTS ON PLANTS. *(Auswirkungen auf die Pflanzen). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:324, Dec. 197*

The impact of air pollution on plants in general, and on trees in particular, is outlined. Several plants are highly sensitive to air pollutants, especially to fluorine, sulfur dioxide, and ethylene. Direct injury of the epidermis, penetration of the toxic substances through the stomata of the leaves and needles, and resorption from contaminated rainwater and contaminated soil are possible. While relatively high concentrations of air pollutants cause visible, serious damage to plants, low concentrations can reduce the vitality of the plants, and can increase their sensitivity to cold, drought, heat, and pests. Mixtures of SO2, and ozone, as well as of SO2 and nitrous gases are especially dangerous due to the potentiating effect of the individual components.

39985 **APTIC NO. 62593**

Hyogo Prefecture Agricultural Experimental Test Station

THE EFFECTS OF OZONE ON TOMATOES. *(Ozon no tomato ni oyobosu eikyo). Text in Japanese. Hyogo Kenritsu Nogyo Shikenjo Gyomu Kotei, 1972 (Annu. Rep. Hyogo Prefect. Agric. Exp. Stn.), 1973: 34-37, 1973.*

Six species of tomatoes were exposed to ozone to see the level of tolerance and the relationship between the plant sensitivity and system changes. Intermittent exposures were given to tomatoes between September and December in an exposure chamber. The temperature, humidity, and ozone concentration were controlled artificially. With exposures of 0.1 ppm of ozone for 10 hr, no visible signs of damages were noted. With 0.2 ppm of ozone for 5 hr, unopened leaves showed no effect, and young leaves showed relatively little effect. The most sensitive leaves were the most actively growing leaves of medium size. The pore functions and photosynthesis seemed to be affected. Visible dark brown spots appeared. The rate of damages were higher with a short-term exposure to a high concentration ozone than to a long-term exposure at a low concentration. The effects were most diverse at levels between 0.1-0.5 ppm, and slight changes of concentration within the limit affected the degree of damages considerably. With the exposure to 0.2 ppm for 5 hr, the amount of reduction sugar and total sugar increased; the amount decreased with a low concentration exposure. The level of carbohydrate showed a reverse effect.

1972

39986 **APTIC NO. 61010**

Faller, N.

SULFUR DIOXIDE, HYDROGEN SULFIDE, NITROUS GASES AND AMMONIA AS SOLE SOURCES OF SULFUR AND NITROGEN FOR HIGHER PLANTS. *(Schwefeldioxid, Schwefelwasserstoff, nitrose Gase und Ammoniak als ausschliessliche S- bzw. N-Quellen der hoeheren Pflanze). Z. Pflanzenernaehr. Bodenk., 131(2):120-130, 1972. 24 refs. Translated from German, 16p.*

Plants were subjected to long-term exposures to sulfur dioxide, hydrogen sulfide, ammonia, and nitrogen dioxide to determine if gaseous absorption can be the only source of sulfur and nitrogen. Sulfur dioxide exerted a clear effect on plant production. The strongest action of the nutrient was on the youngest upper leaves. Most of the sulfur taken up from the air was converted to sulfate (sunflowers 92.65%, corn 85.81%, tobacco 92.57%, oil radish 91.57%). A noticeable proportion was also incorporated into the organic material (sunflowers 25.61%, corn 32.85%, tobacco 26.86%, radish 25.1%). In tests in a sulfur-free nutrient solution, SO2 served as the sole sulfur source. In an experiment with sunflowers, H2S-exposed plants showed normal growth, while control plants grew less and exhibited sulfur deficiency. The H2S uptake is of lower intensity than SO2, but this is all to the good, since SO2 can cause too great a sulfur accumulation in the assimilatory organs. Nitrogen content of plant material increased as NO2 content rose, and NO2 was a sole source of nitrogen. Ammonia also ensured plant growth, not only during the development stage, but over the entire growth period. Damage to plants appeared at the highest NH3 concentrations, however. Thus, these gases can serve as the sole source of sulfur and nitrogen for higher plants, providing normal growth during the whole duration of the experiment. Sulfur and nitrogen were taken up by the plants from these compounds and transposed to the roots. With the sulfur gases, assimilation was more intense with SO2 than with H2S. With the nitrogen-containing gases, the uptake was more intense with NH3 than with NO2.

39987 **APTIC NO. 61884**

Matsushima, Jiro

INFLUENCE OF SULFUR DIOXIDE AND NITROGEN DIOXIDE ON ASSIMILATION OF AMINO ACIDS, ORGANIC ACIDS, AND SACCHAROID IN CITRUS NATSUDAIDAI SEEDLINGS. *(Nisanka io oyobi nisanka chisso ga natsudaidai jissei no aminosan, yukisan oyobi torui no doka ni oyobosu eikyo). Text in Japanese. Mie Daigaku Hogakubu Gakujutsu Hokoku (Bull. Faculty Agric., Mie Univ.), no. 44:131- 139, Nov. 1972. 9 refs.*

The influence of sulfur dioxide and nitrogen dioxide on assimilation of amino acids and organic acids from carbon-14-labeled carbon dioxide was studied in Citrus Natsudaidai seedlings. Fumigation of 20 ppm SO2 for 1 hr resulted in a decrease in the cationic fraction of amino acids, an increase in the anionic fraction of organic acids, and the observance of a medium degree of visible injury. The effect of NO2 was less than SO2, and 40 ppm fumigation for 16 hr caused only slight visible injury. A remarkable difference, however, was noted between the effect of SO2 and NO2 on metabolism of organic constituents. Nitrogen dioxide markedly stimulated more amino acid assimilation and more decreased organic acid than SO2. Different mechanisms appear to be associated with the effects of SO2 and NO2 despite the similarity of visible injuries.

39988 **APTIC NO. 62068**

Miles, C. D., J. R. Brandle, D. J. Daniel, O. Chu-Der, P. D. Schnare, and D. J. Uhlik

INHIBITION OF PHOTOSYSTEM II IN ISOLATED CHLOROPLASTS BY LEAD. *Plant Physiol., 49(5):820-825, 1972. 34 refs.*

The inhibition of photosynthetic electron transport in isolated chloroplasts by lead salts was demonstrated in chloroplasts from spinach leaves. Photosystem I activity, as measured by electron transfer from dichlorophenol indophenol to methylviologen, was not reduced by the treatment of lead salts. However, photosystem II was inhibited by lead salts when electron flow was measured from water to methylviologen and Hill reaction or by chlorophyll fluorescence. Fluorescence induction curves indicated the primary site of inhibition was on the oxidizing side of photosystem II. This site was between the primary electron donor of photosystem II and the site of water oxidation which could be demonstrated by hydroxylamine restoration of normal fluorescence following lead inhibition. (Author abstract modified)

39989 **APTIC NO. 61672**

Sarosiek, J., B. Twarda, B. Bury-Burzymska, and D. Kowaliszyn

DAMAGE TO PLANTS CAUSED BY POST FLOATATION SMOKES FROM THE COPPER COMBINE OF LUBIN. *(Uszkodzenie roslin wywolane dymami poflotacyjnymi Kombinatu Miedziowego w Lubininie). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(3):17-23, 1972. 9 refs.*

NTIS: TT 72-54023/3

Because of the planned further development of the Copper Combine of the Lubin District Mining Company and of the appraisal of previous damages to pine forest by post floatation smoke, it was necessary to study the susceptibility of various wild plant species to the toxic properties of the smoke. Tentative investigations conducted during the growing season of 1970 made it clear that out of 136 species of examined green plants, trees, and shrubs, 35 displayed symptoms of disease, and in 26 of them the post floatation smoke was the pathogenic agent. These findings and an assessment of ecological conditions in the area provide the means for determining the danger of the post floatation smoke and for amending the borders of the danger zone for pine forests in Lublin and at Polkowice. (Author abstract modified)

39990 **APTIC NO. 61763**

Taniyama, Tetsuro

STUDIES ON THE DEVELOPMENT OF SYMPTOMS AND THE MECHANISM OF INJURY CAUSED BY SULFUR DIOXIDE IN CROP PLANTS. *(Sakumotsu no aryusan gasu shogai no jittai to sono kiko ni kansuru kenkyu). Text in Japanese. Mie Daigaku Hogakubu Gakujutsu Hokoku (Bull. Faculty Agric., Mie Univ.), no. 44:11-130, Nov. 1972. 101 refs.*

Various crop plants were fumigated with different concentrations of sulfur dioxide in order to examine injury symptoms and mechanism in relation to SO2 concentration, air temperature, relative humidity, light intensity, and growth stage of the plant. Relative resistance of the plants to SO2 was observed in the following order (greatest resistance to least resistance) for the vegetative stage: paddy rice, barley, tobacco plant, orchard grass, and alsike clover; for the reproductive stage the order was paddy rice, barley, and tobacco plant. Injury was observed on the leaves of both rape and barley even under dark conditions. Percentage of injury in dry weight was generally higher at 30 C than at 10 C in barley plants exposed to SO2. Injurious effects of SO2 on the apparent photosynthesis of both rape and barley varied with difference of air temperature during treatment with SO2, concentration of SO2, and treatment time for which the plants were exposed. The content of sulfur absorbed in rice plant leaves increased in proportion to the concentration of SO2 received, although that of the kernels was not influenced by the gas, indicating that sulfur accumulated in the leaves for a long time and was not translocated to other portions.

39991 **APTIC NO. 62323**

Zimdahl, R. L.

LEAD IN SOILS AND PLANTS. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 98-123, 1972. 12 refs.*

NTIS: PB 223623

The contamination of roadside soil and plants by automotive lead was studied along an interstate highway in Colorado and in the laboratory. A major portion of the lead emitted by automobiles traveling on the interstate was deposited within 50 ft of the highway. The lead moved downward into the soil at a very slow rate. Values up to 1000 ppm occurred adjacent to the highway. The background lead level for soils in the same area was approximately 22 ppm. Soil sorption studies showed that equilibrium occurs within 48 hr. Studies of seven different soils with varying characteristics showed that the Langmuir sorption equation best describes the process; that is, each soil showed a maximum value for the sorption of lead. The capacity of the soil to sorb or immobilize lead was correlated with the cation exchange capacity of the soil. This effect was attenuated by pH which decreases the capacity of the soil to sorb lead and in theory should make the lead more available to plants. Studies with plants grown in hydroponic culture and then exposed to lead nitrate solutions showed that several different plants have a great capacity to take up lead from solution. Soil studies showed a relationship between soil lead levels and the amount of lead taken up by the plant. Foliar uptake of lead was studied with a special apparatus. Studies involving detached cuticles showed very little transport of lead across the foliar cuticular barrier. (Author abstract modified)

39992 **APTIC NO. 62341**

Illinois Univ. at Urbana - Champaign, Urbana, Environmental Studies Program

ENVIRONMENTAL POLLUTION BY LEAD AND OTHER METALS (PROGRESS REPORT). *National Science Foundation IRRPOS Grant GI-26, RANN Grant GI-31605, Rept. NSF/RA/E-72-001, 462p., May 1972. 90 refs.*

NTIS: PB-222 824

A progress report of interdisciplinary research conducted by a number of groups to develop an understanding of the movement and effect of lead and other trace metals in the environment so that decisions regarding control of these possible pollutants might be made more rationally is presented. The total ecosystem group has obtained preliminary data on lead inputs, outputs, and other system fluxes. Background information on lead concentrations and biomass of plants, animals, and the aquatic community has also been collected. The air-soil-water-plant continuum group has found that lead halide aerosols generated from controlled temperature melts were significantly more stable than lead halides in automobile exhaust. Studies of soils revealed significant accumulations in roadside areas. Plant and animal uptake studies indicate appreciable uptake of lead and cadmium. Net photosynthesis, transpiration, and respiration are decreased by lead and cadmium. The animal processes group studied lead interactions with a target organ tissue, the red blood cell membrane, lead influences on the metabolic pathway leading to heme synthesis, and lead accumulations in, and disappearance from, mammalian tissues. The modeling team has concentrated on total ecosystem transport modeling, plant and animal uptake, distribution modeling, and economic systems modeling.

1971

39993 **APTIC NO. 61015**

Hordynska, Sabina and Bronislawa Legatowa

THE DETERMINATION OF SUBMICRO QUANTITIES OF MERCURY IN FEED MIXTURES FOR HENS. *(Oznaczanie submikrogramowych ilosci rteci w mieszankach paszowych dla kur). Roczinki Panstwowego Zakladu Higi, 22(3):317-319, March 1971. 4 refs. Translated from Polish, 3p.*

When mercury traces were found in eggs, sources of mercury in hen feed were studied. Specimens of maize, barley grain, and feed mixtures D and K were obtained on the farm. By titrimetric measurement, an average of 0.06 and 0.08 mg Hg/kg were found in the feed mixtures, respectively; no Hg was found in the maize or barley. These determinations were verified by spectrophotometry; results were 0.89 and 0.066 mg Hg/kg, respectively.

39994 **APTIC NO. 62847**

Ohi, Gen, Masao Fukuda, Hironobu Seki, Hiroko Maeda, Kunio Yunome, Kazuyuki Akiyama, and Hiroshi Yagyu

PIGEONS, SENSOR OF LEAD POLLUTION. *(Hato, en osen no shihyo). Text in Japanese. Tokyo Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rept. Tokyo-to Lab. Med. Sci.), vol. 23:295-298, 1971. 14 refs.*

One hundred and seventy-six adult street pigeons were captured at five locations in both downtown and suburban Tokyo and measured for lead levels in blood, femur, and kidney, and for delta- aminolevulinic acid dehydratase activity. There were marked regional differences in these parameters, corresponding to the severity of lead aerosol pollution. Thus, pigeons appear to be a sensitive biological indicator of lead pollution.

1970

39995 **APTIC NO. 61724**

Costonis, A. C

ACUTE FOLIAR INJURY OF EASTERN WHITE PINE INDUCED BY SULFUR DIOXIDE AND OZONE. *Phytopathology, vol. 60:994-999, 1970. 17 refs.*

Ramets of eastern white pine (Pinus trobus) were exposed to both sulfur dioxide and ozone in a controlled environmental chamber. Current needles between 4 and 5 wk old were acutely injured by SO2 at dosages ranging from 15 + or - 5 pphm for 2 hr to 5 + or - 1.5 pphm for 1 hr. New needles on different branchlets of the same tree could be independently injured by either O3 or SO2 at approximately 25 + or - 5 pphm for 2 hr. Sulfur dioxide was considerably more phytotoxic than O3. Macroscopic differences in development of injury on new needles induced by both gases are discussed. No histological differences of diagnostic significance were noted between the two kinds of injury. (Author abstract)

39996 **APTIC NO. 61710**

Webster, Barbara D.

EFFECTS OF AIR POLLUTION ON THE GROWTH AND DEVELOPMENT OF BEANS. *Dept. of Agriculture, Agricultural Research Service, Dry Bean Res. Conf., 10th, Davis, Calif., 1970, p 24-33. 27 refs. (Aug. 12-14, Paper ARS 74-56.)*

The effects of air pollution on the growth and development of beans are discussed. Air pollution damage accounts for 1/4 of the crop loss in California. The nature of the injury which bean plants sustain suggests the particular nature of the pollutant. For example, ozone, peroxyacetyl nitrate (PAN), ethylene, sulfur dioxide, and fluorine compounds produce a unique pattern of damage, leaving on the bean plant a graphic, visible record of the particular air pollution episode. Some of the most typical morphological modifications of bean growth which result from pollutant exposure include flecking of the leaf surface, silvering or bronzing of leaves, breakdown of chlorophyll-containing cells, and leaf flower drop. Physiological modification include a loss of the selective permeability of cell membranes, a decrease in carbon dioxide fixation, an inactivation of the growth hormone indoleacetic acid, and a blockage or retardation of starch hydrolysis. Investigations designed to alleviate air pollution damage to beans involve studies of the control of the dissemination of air pollutants, the breeding and development of resistant bean varieties, the periodic renewal of growth hormones by spraying, and the direct application of certain compounds known to increase the tolerance of beans to pollutants. (Author summary modified)

39997 **APTIC NO. 61725**

Wert, Steven L., Paul R. Miller, and Robert N. Larsh

COLOR PHOTOS DETECT SMOG INJURY TO FOREST TREES. *J. Forestry, vol. 68:536-539, 1970. 3 refs.*

Aerial photographic techniques for detecting and evaluating air pollution damage to forest trees were investigated. Five photographic scales and four film types were tested in forested mountain areas near Los Angeles, Calif. Tests were held during June, Aug., and Dec. December was the most desirable month for detecting and evaluating affected trees, June the next best, and Aug. least desirable. In Aug. the flush of new needles masked the affected needles seen in June. By Dec., exposure to the daily smog cycle was sufficient to affect all sensitive needles. Results indicate that true color film at a scale of 1:8000 was best for detecting areas of affected trees. The same color film at 1:1584 scale was found best for evaluating affected trees. (Author abstract)

1954

39998 **APTIC NO. 62675**

Butterfield, Norman W.

ROSES AFFECTED BY MERCURY COMPOUNDS IN GREENHOUSE PAINT. *Florist s Exch. Hort. Trade World, 123(18):14, 1954.*

Several instances of damage to flowers grown in a greenhouse by mercury vapors are reviewed. Rose flower buds were affected by vapors emanating from soil treated with bichloride of mercury to control earthworms. In another case, mercury vapors from fresh paint caused reduced plant growth and damage to flowers. A test of the paint was done at the Waltham Field Station. Mercury vapor was detected near freshly painted walls and an open pail of paint. Plant damage occurred to rose flowers and stems which was believed to be due to mercury vapors from the paint. Harmful effects of mercury to humans are reviewed. The maximum allowable concentration for continued exposure is 1 mg/10 cu m of air. Because of its toxic action, paint with a mercury fungicide should not be used near roses.

EFFECTS-MATERIALS

1973

39999 **APTIC NO. 61786**

Tokushima, Yasuo, Joji Ito, and Masanao Tachikawa

AIR POLLUTION CONTROL OF EXHAUST GAS FROM DRYING OVEN OF PAINT SHOP AND INVESTIGATIONS OF ITS EFFECTS TO COATING QUALITY. *(Toso kansoro no haishutsu gasu taisaku to tosohinshitsu eno eikyo chosa). Text in Japanese. Toyota Gijutsu (Toyota Eng.), 23(4):383-391, Dec. 1973. 9 refs.*

The components in the exhaust gas from the drying oven of a paint shop were analyzed and their effects on coating quality were investigated. For water-soluble paint in the baking drying oven it was recommended that the exhaust gas be burned by direct combustion and then cleaned by water washing and adsorption by active charcoal. For organic solvent-soluble paint in the same furnace exhaust gas should be burned over a catalyst. Nitrogen oxides caused yellowing and abnormally rapid hardening of sulfaces. Epoxy and melamine resins were more readily affected by acidic atmospheres than were alkyd resins.

EFFECTS-ECONOMIC

1974

40000 **APTIC NO. 61840**

Benson, J. R. and M. Corn

COSTS OF AIR CLEANING WITH ELECTROSTATIC PRECIPITATORS AT TVA STEAM PLANTS. *J. Air Pollution Control Assoc., 24(4):340-348, April 1974. 7 refs.*

Cost data were analyzed from 30 steam power plant units utilizing electrostatic precipitators with or without mechanical centrifugal collectors. Operational, maintenance, and total costs for the year 1969, 1970, and 1971 were expressed in 1972 dollars as $/cfm-yr and $/cfm-yr-efficiency. The latter parameter is a new one which normalizes the cost of air cleaning by accounting for the amount of particulate matter collected. Large differences in the costs of air cleaning were found between plants and even between units operating in the same plant. Maintenance costs appeared to be the main contributor to large total cost differences, but improved, more specific accounting procedures are required to focus more closely on the reasons for cost differences. (Author abstract)

40001 APTIC NO. 59630

Porter, F. D.

LEAD IN PETROL -- WHAT PRICE ITS REMOVAL? *Chem. Brit., 10(2):61-62, Feb. 1974. 5 refs.*

In the last 3 months many governments have had to set aside their plans for reducing the lead content of gasoline, not because of the extra cost involved (about 2.4 cents/gal), but because of the increased crude oil consumption. If the octane numbers were changed and tetramethyl lead used as the antiknock agent, the Pb emissions and the costs of gasoline could be reduced without increasing crude oil consumption. Tetramethyl lead is much more effective than tetraethyl lead, yet only 20% more expensive. Its use could reduce the cost of gasoline by about .96 cents/gal. (Author abstract modified)

40002 APTIC NO. 62790

Preining, Othmar

ON THE COSTS OF AIR POLLUTION IN AUSTRIA. *(Zur Frage der Luftverunreinigungen in Oesterreich). Text in German. Inst. National de Recherche Chimique Appliquee, Paris (France). Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 3-1-3-11. (May 8-10.)*

The costs of air pollution damage to materials, health, and plants in Austria is estimated on the basis of a similar estimation by the U. S. Environmental Protection Agency for the USA. For the estimation, the relevant conditions in Austria and the USA were assumed similar, and the damage was assumed to be proportional to the emissions. Based on the 1970 emission data for Austria, the costs of sulfur oxide damages to materials, health, and plants amounted to approximately 21,000,000, 33,000,000, and 950,000 dollars, corresponding to 0.295% of the gross national product. The particulate matter-inflicted damages cost 36,000,000 dollars and accounted for 0.165% of the gross national product. Nitrogen oxides-induced damages, accounting for 0.08% of the gross national product, cost 16,200,000 in materials and 2,000,000 dollars for plants. Stationary equipment including domestic heating equipment were responsible for a loss of 0.21%, while transportation and industry were responsible for the 0.16% and 0.17% loss in the gross national product.

40003 APTIC NO. 62603

CURRENT ENVIRONMENTAL DESTRUCTION. SITUATION IN JAPAN - ECONOMIC LOSS. *Technocrat (Japan), 7(4):65-70, April 1974.*

Studies of economic losses caused by environmental pollution in Japan are reviewed. Air pollutants cited as causing human health impairment as well as plant and property damage include: sulfur oxides, carbon monoxide, nitrogen oxides, hydrocarbons, suspended solids, and photochemical oxidants. An economic survey conducted by the Osaka Municipal Government looking into the damage caused by air pollution for the first time in Japan as early as 1965 is outlined and shows that air pollution was ranked as the most harmful environmental factor in 1965 and the second most harmful factor in 1973. Total and per capita economic loss estimates are tabulated for various types of environmental destruction.

1973

40004 APTIC NO. 61960

Brar, Jagjit S. and Frank S. Conklin

SOCIAL SUBSIDIES, ENVIRONMENTAL POLLUTION, AND UTILIZATION OF AGRICULTURAL WASTES: AN OREGON EXAMPLE. *South. J. Agric. Econ., 5(2):175-184, Dec. 1973. 19 refs.*

A conceptual framework for the economic and social rationale of subsidies to facilitate commercial utilization of grass residue is presented and a theoretical model of demand and supply relationships in selected residue markets is developed. A policy decision to subsidize the utilization of grass residue involves both economic and social criteria. Economic criteria suggest that magnitude of subsidy payments must take market forces into account, since such payments are intended to alter relative prices so as to favor straw residue. The significance of demand and supply characteristics of residue demand characteristics for final products, and supply characteristics for final products, and supply characteristics of alternative raw materials as important market forces from a static point of view are identified. From an intertemproal standpoint, relative riskiness in the supply of grass straw, along with possible changes in market conditions, also were treated. A subsidy based on economic criteria does not imply that it also will be desirable from a society s viewpoint. A benefit cost analysis can provide an appropriate analytical framework. The framework can be helpful for by-products other than grass where environmental issues are pressing for more acceptable disposal or utilization alternatives. (Author summary modified)

40005 APTIC NO. 62259

Capp, Joseph A.

THE ECONOMIC ADVANTAGES OF BURNING HIGH SULFUR COAL. *Preprint, Purdue Univ., West Lafayette, Ind., 22p., 1973. 7 refs. (Presented at the Industrial Fuel Conference, West Lafayette, Ind., Oct. 3-4, 1973.)*

Sulfur emissions will double the 1968 levels by 1980 even if planned abatement procedures are carried out. There is a deficiency of clean fuels in the U. S., and the costs of products will continue to increase. However, procrastination on energy alternatives is prevalent as environmental legislation is tested. Since a reversal of the established primary emission control regulations is unlikely, sulfur dioxide/particulate control should receive due consideration. Various control techniques including flue gas desulfurization and use of low sulfur fuels (coal, natural gas, or oil) are reviewed with respect to their costs. The Bahco system of flue gas scrubbing with lime is described in detail. Capital cost for the Bahco system for SO2/particulate control is $1,000,000, annual operating cost is $432,455. This system has a higher efficiency than most competitive systems. It is economically advantageous to burn high sulfur coal and then clean the flue gas in a system such as the Bahco system.

40006 APTIC NO. 62087

Hardison, L. C.

AIR POLLUTION CONTROL TECHNOLOGY AND COSTS IN SEVEN SELECTED INDUSTRIES. (FINAL REPORT). *Industrial Gas Cleaning Inst., Stamford, Conn., Office of Air and Water Programs Contract 68-02-0289, Rept. EPA-450/3-73-010, IGCI Rept. 47.173, 724p., Dec. 1973. 82 refs.*

NTIS: PB 231757/AS

Air pollution abatement is discussed for phosphate fertilizer manufacturing, feed and grain milling, soap and detergent manufacturing, paint and varnish production, the graphic arts industry, lime kiln operation, and gray iron foundry cupola operation. For each area studied, costs of conventionally applied control systems are presented for a range of plant sizes and control efficiencies. Specifications and costs are described for electrostatic precipitators, wet scrubbers, and fabric filters for particulate control and wet scrubbers, thermal and catalytic incinerators, and adsorption units for gaseous pollutant control.

40007 **APTIC NO. 62263**

Kennedy, A. S., R. I. Reisenweber, K. G. Croke, and M. A. Snider

AIR POLLUTION/LAND USE PLANNING PROJECT. VOLUME III. AN ECONOMIC COMPARISON OF POINT-SOURCE CONTROLS AND EMISSION DENSITY ZONING FOR AIR QUALITY MANAGEMENT (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Center for Environmental Studies, Office of Air and Water Programs Interagency Agreement EPA-IAG-0159(D), Rept. EPA- 450/3-74-028-c, 133p., May 1973. 65 refs.*

The value of land use zoning policies in achieving and maintaining air quality standards in existing large urban areas, or in smaller but rapidly developing areas was assessed. The traditional permitted use zoning policies, as well as the more recent emission density limited zoning (EDLZ) concept are evaluated and compared with current source control regulations being adopted in most state implementation plans. A systematic air pollution control policy evaluation methodology was developed to carry out the evaluation. A least cost EDLZ policy was formulated in order for air quality to be achieved throughout the Chicago region. The least cost EDLZ limits were 3.3 tons/day/sq mi for heavy industry and 0.85 tons/day/sq mi for light industry, based on present manufacturing land use. When the current zoned land inventory was included, the limits decreased to 2.5 tons/day/sq mi for heavy industry and 0.55 tons/day/sq mi for light industry. The total annual cost for 475 selected industries with EDLZ based on present land use is 1.452 million dollars. When the current zoned land is included, the cost rises to 1.535 million dollars. The point source control and EDLZ approaches do not differ greatly in cost or resource utilization; as a result, EDLZ is a potentially viable economic control for achieving and maintaining ambient air quality. (Author abstract modified)

40008 **APTIC NO. 62333**

Myers, M. L.

COST ESTIMATES FOR THE LIMESTONE WET SCRUBBING SULFUR OXIDE CONTROL PROCESS. *Atomic Energy Commission, Oak Ridge, Tenn., Oak Ridge National Lab., 86p., July 1973. 78 refs.*

NTIS: ORNL-TM-4142

A cost model for a commercially available full scale sulfur oxide control process is presented for use in the Oak Ridge National Laboratory CONCEPT-II computer code. Stack gases from a coal-fired and from an oil-fired plant are treated similarly by limestone in the west scrubbing process. Included are mid-1972 costs at the subaccount levels for equipment, site labor, and materials, as well as the bases for estimating the various accounts and the special information related to making the estimates. Operating and maintenance costs are estimated. (Author abstract)

40009 **APTIC NO. 62286**

Dept. of Commerce, Bureau of Competitive Assessment and Business Policy

POLLUTION CONTROL COSTS AND INTERNATIONAL COMPETITIVENESS. *In: U. S. Industrial Outlook 1974 with Projections to 1980. p. 7-10, Oct. 1973.*

GPO

As pollution control legislation has increased in scope, costs have increased. These increased costs have in turn increased the market prices of goods, and thus reduced the competitive advantage of U. S. goods while increasing the advantage of the cheaper foreign goods. According to the Federal Water Pollution Control Act, the Secretary of Commerce must determine the effects of pollution control costs on competitiveness. The effects of Federal pollution abatement programs on costs, economics, competitiveness, and industry are discussed. It is difficult to translate production costs into market prices. Several pollution cost studies have been carried out which may help determine the extent to which international competitive disparities are developing because of rising pollution control costs.

1972

40010 **APTIC NO. 61977**

Ayres, Robert U. and Ivars Gutmanis

TECHNOLOGICAL CHANGE, POLLUTION AND TREATMENT COST COEFFICIENTS IN INPUT-OUTPUT ANALYSIS. *In: Population Resources, and The Environment. Vol. 3. Resources for the Future Inc., Commission on Population Growth and the American Future, p. 313-337, 1972 (?). 10 refs.*

The empirical and conceptual modifications made in a core Interindustry Forecasting Model are described. The model was developed to project economic activity, resource requirements, and pollution loadings, nationally and regionally, to the year 2000, and in some instances beyond. The modifications allowed the basic model to be extended beyond the previous limit of 1980 to 2000 (for some purposes to 2020), to introduce explicit technical forecasts to the model, and to attach specific pollution and treatment cost coefficients to the model so that environmental consequences of a variety of assumptions about economic growth and abatement policies could be studied. The model was used to determine the economic impact of substitutions of one purchased input (including labor) for another. Sectors of the economy contributing to air, water, and solid waste pollution are listed. Direct air pollution output coefficients from heat and power generation and industrial processes in the U. S. 1967-1979 are listed. Projected trends in air pollution loads from heat and power generation and from industrial processes, 1980-2000, are listed for hydrocarbons, particulates, sulfur oxides, carbon monoxide, and nitrogen oxides for various sectors of the economy. Cost coefficients are listed for air pollution abatement from heat and power generation and industrial processes by selected sectors of the economy assuming Clean Air Act standards for 1967-1979.

40011 **APTIC NO. 61981**

Babcock, Lyndon R., Jr. and Niren L. Nagda

EMISSION CONTROL STRATEGIES: COSTS AND BENEFITS. *Rhode Island Univ., Coll. of Engineering and Greater Providence Chamber of Commerce. Proc. Northeast. Reg. Antipollut. Conf., 5th, Annu., Kingston, R. I., 1972, p. 1-19. 9 refs. (July 17-20.)*

The U. S. Environmental Protection Agency (EPA) has launched a substantial control program aimed at significantly improving the nation's air quality by 1976. The nationwide cost effectiveness of the program is assessed by relating costs of emission control to air quality improvement and to economic-damage reductions. A pollution index derived from EPA ambient standards is used to assess pollution levels. The study is restricted to control cost information supplied by EPA. Annual damages due to air pollution were assumed to equal $16 billion for the 1967-68 period. Thirty-eight emission categories were studied, and cost/benefit ratios (control cost/damage reduction) were determined as the measure of cost effectiveness for each category for which cost information was available. Despite economic and population growth, implementation of the EPA strategy should reduce air pollution damages by 1976 to 56% of 1967 levels. The overall cost effectiveness is estimated to be 0.5. Steam- electric power plants produce 27% of the total nationwide damage, 73% of the damage could be reduced due to control which gives a cost/benefit ratio of 0.4. For 1967-1976 gasoline motor vehicles, these values are 12%, 43%, and 0.2%, respectively; for post-1976 vehicles they are 12%, 86%, and 2%; for industrial boilers they are 10%, 60%, and 1.0%. This indicates a considerable incentive to control electric power plant emissions. For industrial boilers, the costs of control roughly equal the benefits. Benefits will exceed costs for cars through 1976, however, the costs of achieving stringent 1976olevel control for all cars is high with benefits amounting to only half the control costs involved. Thus, land use and traffic management alternatives should be explored as alternatives to the 1976-level automobile emission control program. (Author summary modified)

40012 **APTIC NO. 61983**

Babcock, Lyndon R., Jr.

ESTIMATION OF EMISSION CONTROL COSTS FOR PARTICULATE AIR POLLUTANTS. *Rhode Island Univ., Coll. of Engineering and Greater Providence Chamber of Commerce, Proc. Northeast. Reg. Antipollut. Conf., 5th, Annu., Kingston, R. I., 1972, p. 34-53. 12 refs. (July 17-20.)*

A generalized, rapid method called emcost is described for approximating particulate emission control costs for industrial processes. It consists of a single exponential equation using flue gas flow rate and recovery efficiency terms to approximate total hourly capital and operating costs for unspecified pollution control equipment. Within the discretion of the user, the method is applicable to any efficiency, for any process, for which a flue gas flow rate is known or can be estimated. The model indicates infinite cost at normally unattainable 100% emission control. For a given efficiency, costs are almost directly proportional to flue gas volume. Small economies of scale exist within a given process, but the unit cost differences due to process scale are much less than those occurring between different processes. Estimates of pollution control costs can be compared with product value to obtain the relative significance of emission control expenditures. The method is applied to combustion power plants, cement plants, refuse incinerators, and blast and open hearth furnaces. An expenditure of 1% of the product value results in only 75% control for a coal-fired electric power plant with high gas flow rate; the same expenditure could achieve 97% control in a large cement plant or over 99.9% control in steel industry processes which have relatively small gas volumes. New installations for some processes can attain extremely high recovery efficiencies economically. The situation is less clear-cut for existing obsolescent units having service lives shorter than the 15 years assumed in the emcost model. Recovery of products and raw materials can complicate cost estimate; for example, recovered materials from cement plants and blast furnaces can offset the concurrent control costs. Although emcost can approximate the cost of any level of emission control, it does not forecast the desirability of such control. (Author abstract modified)

40013 **APTIC NO. 62297**

Glowiak, Bohdan and Piotr Kabsch

TECHNICAL-ECONOMIC ESTIMATION OF REDUCTION OF POLLUTANTS IN ATMOSPHERIC AIR. *(Techniczno-ekonomiczna ocena metod redukeji zanieczyszczen w powietrzu atmosferycznym). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(4):43-52, 1972. 6 refs.*

NTIS: TT 72-54023/4

Technical and economic methods of estimating the technique of reduction of pollutants in the atmosphere are described. The type and size of emission from a single source or a group of sources is of basic importance in dealing with the problem of air pollution. There are at least three independent methods of size emission determination: on the basis of the material balance of the entire process determination; on the basis of the material balance of the entire process; and with the use of emission indicators by way of direct measurement. Four factors should be taken into account to calculate the size of emission from a group of sources or from a region or the whole country: emission indicator for uncontrolled sources (or for unorganized emission), total volume of yearly output; efficacy of purifying devices, and percentage of sources provided with purification facilities. An indicator of total cost efficiency was developed and is proposed for purposes of comparative estimation of expenditure. (Author abstract modified)

40014 **APTIC NO. 61976**

Herzog, H. W., Jr. and Ronald G. Ridker

THE MODEL. *In: Population Resources, and The Environment. Vol. 3. Resources for the Future Inc., Commission on Population Growth and the American Future, p. 301-311, 1972 (?). 10 refs.*

A model was developed to project economic activity, resource requirements, and pollution loadings, nationally and regionally, to the year 2000, and in some instances beyond. The complete package consists of a core Interindustry Forecasting Model, modifications, and subsidiary models. The core model, projection of final demands, personal consumption expenditures, gross private domestic investment (equipment investment, construction, inventory changes), exports and imports, government purchases of goods and services, resource requirements and pollution generation, regional environmental quality, and policy simulation are discussed.

40015 **APTIC NO. 61985**

McKenna, J. D. and D. W. Coy

TECHNO-ECONOMIC SELECTION IN TIMES OF CHANGING COSTS AND PERFORMANCE REQUIREMENTS. *Rhode Island Univ., Coll. of Engineering and Greater Providence Chamber of Commerce, Proc. Northeast. Reg. Antipollut. Conf., 5th, Annu., Kingston, R. I., 1972, p. 234-249. 9 refs. (July 17-20.)*

Based upon the cost of the control system, its expected life, its adaptability to future codes, the timetable of the future codes and an assignment of weights to each of these factors, an industry can make its decision as to its best option for control. Changes which have taken place in the last decade in the equipment selection process are reviewed. Several case histories are used as examples, including that of a baghouse to fume cleaning of an oxygen-lanced open hearth furnace and that of a plan for the compliance of a power plant to particulate and sulfur dioxide air pollution codes. In times of changing legislation, industries must consider not only present codes, but also all possible codes within the life of the equipment (say at least a decade). In doing so, one must also consider that there is the possibility that the market in the next five years may become a sellers market, and therefore prices may rise more rapidly than they have to date. The recommended steps for system selection are to determine the present code, establish the present emission limits, screen all systems for ability to meet these emission limits, determine the annual cost of these systems for meeting present emission limits, forecast relevant codes for the next decade, quantify the effect of the important factors other than annualized cost, and finally, select the system.

40016 **APTIC NO. 61974**

Ridker, Ronald G.

THE ECONOMY, RESOURCE REQUIREMENTS, AND POLLUTION LEVELS. *In: Population Resources, and The Environment. Vol. 3. Resources for the Future Inc., Commission on Population Growth and the American Future, p. 35-57, 1972 (?). 7 refs.*

A mathematical-economic model of the American economy, its resource requirements, and pollution loadings was developed. The demographic and economic indicators are given for several populations and economic assumptions are listed. Resource requirements for alternative population and economic assumptions are also discussed. An estimate was made of the amount of individual pollutants generated by different production and consumption activities by 10-year intervals to the year 2000. Pollution emissions were estimated with no change in abatement policy and an active pollution abatement policy. While there are savings in resource and environmental depletion to be gained from a slowdown in population and economic growth, some policies that directly attack resource and environmental problems result in greater savings. However, direct attacks on the problems, such as an effective abatement policy, may be very difficult to implement. This analysis does not consider all resources and pollutants and is limited to a 30 to 50 year time horizon. Thus, there are benefits to be derived from reductions in population and economic growth that do not show up in the numerical estimates of savings presented. In the long run, reductions in population growth are probably more important than reductions in economic growth.

40017 **APTIC NO. 62328**

Saig, E. and L. M. Hartman

ECONOMIC ASPECTS OF AUTOMOTIVE LEAD. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 200-224, 1972. 7 refs.*

NTIS: PB 223623

Estimates were made of the economic effects of removing lead from gasoline using primary data. These estimates served as a check against the estimates derived from the Department of Commerce national input-output data. Data on regional impacts were also collected by mail survey and by personal interview; these data are in the process of analysis. Since the manufacture of tetraethyl and tetramethyl lead uses 83% of the sodium and 90% of the ethylchloride manufactured in the U. S., the removal of lead would affect the manufacture of these compounds. The effects of stopping lead usage in gasoline would be $389 million on income, $112 million on wages, $281 million on capital, and 15,000 persons unemployed in the organic chamicals industry. The most important regions affected by the lead mining industry are Missouri, Idaho, Utah, and Colorado. Lead smelting and refining in Missouri, Idaho, Montana, Texas, Utah, Nebraska, and Illinois would be affected. Stoppage of lead antiknock use might cause these plants to shut down completely or partially.

40018 **APTIC NO. 62032**

Watson, William D., Jr.

COSTS OF AIR POLLUTION CONTROL IN THE COAL-FIRED ELECTRIC POWER INDUSTRY. *Q. Rev. Econ. Bus., 12(3):63-85, 1972. 30 refs.*

Methods for determining the costs of air pollution control in the coal-fired electric power industry are discussed. The Clean Air Amendments of 1970 establish national air quality standards for selfur dioxide and particulate matter. These will probably require substantial reductions in fly ash and SO2 discharges from coal-fired power plants. A challenge in pollution control is to account for all residual pollutant flows in structuring optimal pollution control. A solution might be to have taxes both on the sulfur, nitrogen, and ash content of fossil fuels and on radioactive elements with rebates from emission control in each case. For any given discharge level an efficient way in which to structure pollution control would be to use effluent charges. The tax on SO2 discharges and the accompanying coal demand shifts should also provide an incentive for the shift of resources away from the mining of high S coal and into the mining and transportation of lower S coal such as Wyoming coal. Collected effluent charges could be used to finance the development of clean combustion technologies and fuels, possibly with recycling of waste byproducts. (Author conclusions modified)

40019 **APTIC NO. 61699**

Organisation for Economic Co-operation and Development, Air Management Research Group

COST OF FLUE GAS DESULPHURIZATION, METHOD OF ASSESSING OVERALL COSTS AS DEVELOPED BY THE UK DELEGATE. *In: Air Management Problems and Related Technical Studies. p. 113-115, 1972.*

A method of assessing the overall costs of flue gas desulfurization is described. The principle of assessing costs which can be applied when reliable basic data are available is to divide the costs into capital, recovery, materials, power, labor, and disposals. This makes it possible to allow for comparison of processes on different assumptions as to load factor, sulfur content of fuel, interest rates, amortization period, and overheads. All processes appear to come within the range $33 to $100 per ton of S captured, whether or not any credit for sale of product was given.

40020 **APTIC NO. 62049**

Council on Environmental Quality, Washington, D. C. and Booz-Allen Public Administration Services, Inc., Washington, D. C.

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART 3. *95p., July 27, 1972.*

NTIS: PB 211919

Assuming sustained economic growth of at least 4% per year for 1972-1976, steel consumption should fall into 120-130 million ton range by 1976. Potential net steel shipments, considering domestic consumption and import penetration should be 106-113 million tons/yr by 1976. Based on partial information, domestic raw steel capacity is estimated at 155-165 million tons. Sustainable steel shipment capacity is estimated at 98-105 million tons/yr. To develop the capacity to ship 106-113 million tons by 1976, total domestic production capacity may have to be expanded by 0-16 million tons, depending on the actual level of current capacity and anticipated 1976 demand. Required capital expenditures to modernize and replace existing equipment during 1972-1976 are estimated at $6.85 billion (1971 dollars). Expenditures needed to increase capacity, depending on current capacity and future demand, may range from 0-$6.53 billion over the same period. Air and water pollution abatement costs are estimated at $2.4-3.5 billion for capital investments and $760- 875 million for annual costs, including operating costs, depreciation, and interest, for 1972-1976. Pollution abatement requirements may also result in accelerated capital expenditures of $2.75 billion to replace existing equipment which cannot be economically cleaned up due to age and/or physical condition. The impact of pollution abatement costs on industry growth and profits was analyzed using baseline projections of steel industry profits and cash flow for 1972-1976. Steel price increases of approximately 4.3%/yr for 1973-1976 will be required to cover all steel industry cost increases including pollution abatement annual costs. The ability of the steel industry to maintain growth and absorb pollution abatement costs depends on pollution abatement capital requirements, current production capacity, cost of additional capacity, reserve capacity required, and accelerated capital expenditures. To fund pollution abatement, steel producers will have to borrow at a rate near the industry's feasible borrowing limit, and apply all available internal funds to pollution abatement after provision for dividends at 1971 dollar levels, normal capital expenditures, and working capital.

40021 **APTIC NO. 62823**

National Heart and Lung Inst., Task Force on Research in Respiratory Diseases, Bethesda, Md.

APPENDIX. ECONOMIC COSTS OF RESPIRATORY DISEASES. *In: Respiratory Diseases. Task Force Report on Problems, Research Approaches, Needs. Dept. of Health,* *Education, and Welfare Publication No. (NIH) 73-432, p. 205-243, Oct. 1972. 12 refs.*

Estimates of the economic costs based on aggregate data for the entire United States wherever possible are given for the following types of respiratory disease: inhalation diseases, including pneumoconiosis and pulmonary fibrosis; diseases of the airways, including asthma, bronchitis, emphysema, and cystic fibrosis; interstitial diseases, and vascular diseases of the respiratory system. The economic costs in the United States in 1967 from these respiratory diseases was 6.3 billion dollars, with $1.7 billion for direct costs from illness, $1.4 billion in indirect morbidity costs, and $3.2 billion in indirect mortality costs.

1971

40022 **APTIC NO. 62045**

Elias, Robert J. and John M. Dement

THE FINANCIAL IMPACT OF AIR POLLUTION CONTROL UPON THE PORTLAND CEMENT INDUSTRY. *Preprint, Air Pollution Control Office, Raleigh, N. C., Div. of Economic Effects Research, 45p., Feb. 1, 1971. 7 refs.*

The financial impact of the standards of performance of the Clean Air Act Amendments of 1970 upon the cement industry from 1971 to 1976 is estimated. There are seven indicators of growth in the cement industry: capacity, production and shipments, production/capacity ratio, actual capacity added, new plants, expansions and improvements, and capital investment. New plants and estimated expansions and improvement are most important. Three new plants should be installed in each year of the 5-year period along with three modified kilns. Particulate matter is the primary emission and sources include raw material crushing, raw material drying and grinding, kiln operation, clinker cooling, finish grinding, packaging, and various smaller sources such as material conveying and storage. Little data exist upon which cost estimates could be based for each of these processes. From the search of the available literature, it appears that investment cost of controls for these processes may range from $100 to $260/barrel/day of production capacity. No actual operating cost for these devices are in the literature.

STANDARDS AND CRITERIA

1974

40023 **APTIC NO. 59728**

Larsen, Ralph I.

AN AIR QUALITY DATA ANALYSIS SYSTEM FOR INTERRELATING EFFECTS, STANDARDS, AND NEEDED SOURCE REDUCTIONS--PART 2. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Meteorology Lab., 30p., March 13, 1974. 14 refs.*

Three approaches are examined for calculating design values of an averaging-time mathematical model for interrelating effects, standards, and needed source reductions in an air quality data analysis system. The first approach is recommended when air quality frequency data and a standard are for the same averaging time, while the second can be used when the data and standard are of different averaging times. A third approach uses the second highest concentration ever measured in a calendar year for a particular averaging time as the design value for a standard of that averaging time; the approach has the advantage of using aerometric data without further processing but could lead to spurious results if the sample happened to be spurious. Although the averaging-time mathematical model has generally been used with a 1-year base, a 5-year base is recommended. Tables needed for the latter are provided.

40024 **APTIC NO. 62360**

Lilie, Ruediger H.

THE CLEAN-Air CAR - TECHNICAL OPTIONS - COSTS - EFFECTS. *(Das umweltfreundliche Auto - Technische Moeglichkeiten - Kosten - Auswirkungen). Text in German. Erdoel Kohle - Erdgas - Petrochemie, 27(5):254-258, May 1974.*

Studies have shown that in the entire United States less than forty percent of the total pollution caused by man stems from traffic. Presently the standards which were to go into effect in 1975 were postponed until 1976 by which year it is hoped that the car manufacturers will be able to fulfill the demands of reducing the hydrocarbon emission to 0.41 g/mile and the carbon monoxide emission to 3.4 g/mile. Since the difficult problem of reducing the nitrogen oxides emissions to 0.4 g/mile cannot be realized until 1976 the California solution has been accepted and a 2.0 g/mile limit will go into effect in that year. It is hoped that by 1977 the original demand can be met. An analysis of costs and benefits shows the economic effects of the current American regulations and possible alternative standards. The question is raised whether the stringent American standards should be valid nationwide or only in densely populated areas and whether it makes sense to adopt the American regulations for Europe. Europe should develop its own exhaust exhaust emission regulations, giving due consideration to the climatic, topographic, and regional peculiarities and enough time for an ingenious solution of automobile exhaust emission problems.

40025 **APTIC NO. 61877**

Murase, Akira

THE BASIC IDEA IN THE TOTAL EMISSION REGULATIONS AND THE ACTUAL CONDITIONS - KAWASAKI CITY. *(Soryo kisei no kangaekata to sono jittai). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(5):41-45, May 1974. 2 refs.*

The total emission of sulfur dioxide in the 7 wards of Kawasaki in 1970 was about 130,000 tons. The environmental standard at each ward was set at 0.012 ppm, aiming at reducing the pollutant by 36% in the nonpolluted area and by 98% in the polluted area. From Jan. 1, 1974 to Dec. 31, 1975, factories consuming more than 51 billion kcal of heat/year must not emit more than 0.71 g of SO2/1000 kcal of heat consumption, and those consuming less than that must not emit more than 1.32 g of SO2/1000 kcal of heat consumption, and from Jan. 1, 1976, the allowable SO2 emission will be reduced to 0.34 g for the first group. The emission standards are even lower for new factories, 0.2 g and 1.0 g, respectively.

40026 **APTIC NO. 61789**

Quarles, John

STATE OF ALASKA MISCELLANEOUS REVISIONS TO IMPLEMENTATION PLANS. *Federal Register, 39(69):12871-12872, April 9, 1974.*

Miscellaneous revisions to implementation plans for the state of Alaska are announced. Alaska is proposing revisions to Regulation I of the Tri-Borough Air Resources Management District. The revisions proposed are to rename and reorganize the regulations, bring emission standards into compliance with State emission standards, provide authority for requiring emission data from sources, and meet certain federal criteria. Public comment is invited on whether these revisions should be approved.

40027 **APTIC NO. 62681**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

BACKGROUND INFORMATION FOR NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS AND BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, AND SEWAGE TREATMENT PLANTS. VOLUME 3, PROMULGATED STANDARDS (FINAL REPORT). *Rept. EPA-450/2-74-003, APTD-1352c, 158p., Feb. 1974. 12 refs.*

A third in a series of volumes on new source performance standards is presented for asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The present volume presents the promulgated standards and the rationale for any changes that were made, with particular attention to the problems of opacity and dilution air. Major comments received during the period for public comment are discussed where appropriate and are summarized with Environmental Protection Agency responses in the appendix. The appendices also contain a list of commentators, new data for asphalt concrete plants, revised economic analyses for asphalt concrete plants and petroleum refineries, and errata for Volumes I and 2. (Author abstract modified)

1973

40028 **APTIC NO. 61922**

Inoue, I.

EMISSION STANDARD OF NITROGEN OXIDES. *(Chisso sankabutsu no haishutsu kijun ni tsuite). Text in Japanese. Preprint, Environmental Conservation Engineering Association, Osaka, (Japan), p. 99-109, 1973. 11 refs. (Presented at the Environmental Conservation Engineering Association Seminar on Measurement, Reduction, and Removal of Nitrogen Oxides in Combustion Exhaust, Osaka, Japan, Nov. 8-9, 1973.)*

Environmental standards for nitrogen oxides emission legislated by the Environmental Protection Agency on May 8, 1973, are discussed in terms of effects on human health. The NO2 concentration of 0.06 ppm found in major cities is three times as high as the emission standard. Considering that the growth in fuel consumption is 10% per year, NOx emission should be reduced by 85% in 8 years time. The present NOx standard applies to boilers, nitric acid manufacturing plants, and heat treatment furnaces for metals and petroleum. An NOx emission standard of 130 ppm applies to newly built gas fueled boilers of emission amount greater than 40,000 N cu m[illegible]. A standard of 480 ppm is applied to solid fueled boilers, 180 ppm to other boilers, 200 ppm to metal heat treatment furnaces and nitric acid manufacturing plants, and 170 ppm to petroleum heat treatment furnaces. The regulations require that the NOx measurements should follow the procedure defined by JIS KO104 combined with residual oxygen determinations. Changes in the format of reports for NOx regulation of nitric acid manufacturing plants are described.

40029 **APTIC NO. 61790**

Kato, K.

ENVIRONMENTAL STANDARDS FOR SULFUR OXIDES AND NITROGEN OXIDES AND FUTURE CONTROL. *(Iosankabutsu to chissosankabutsu no kankyo kijun to kongo no kisei ni tsuite). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 11(6):1-8, Dec. 1973.*

New environmental standards have had to be established for sulfur oxides since nitrogen oxide concentrations have been increasing and there is a synergistic effect on human health between SOx, NOx, and aerosols. For SO2 the daily average must be below 0.04 ppm and hte hourly figure must be below 0.1 ppm. The daily average for hourly values for NO2 must be below 0.02 ppm. Both standards must be achieved within 5 years. Thanks to efforts to control it, SOx has recently been decreasing in Japan although the concentrations in most areas are still 2-4 times higher than the standards allow. With fuel consumption increasing more efforts must be made to use low sulfur fuel and install desulfurization facilities. Nitrogen oxides have been increasing with 1971 values being 0.088 ppm in Sapporo, 0.088 ppm in Tokyo, 0.093 ppm in Kawasaki, 0.092 in Osaka, and 0.070 ppm in Amagasaki. Emission of NOx in 1969 totalled 1.4 million tons which can be broken down to 0.58 million tons from general industry, 0.37 million tons from electric power production, and 0.25 million tons from gasoline engines. Nationally, 68% of the emission is attributable to factories. Control of SOx will be made more stringent by stages (1973, 1975, and 1977). In 1975 total volume control measures will be adopted.

40030 **APTIC NO. 61003**

Federal Ministry of the Interior (West Germany)

UNIFORM FEDERAL PRACTICE FOR THE MONITORING OF EMISSIONS FROM PLANTS ACCORDING TO SECTION 16 OF THE TRADE REGULATIONS. HERE: GUIDELINES FOR THE EVALUATION OF CONTINUOUSLY RECORDING EMISSION MEASUREMENTS. *(Bundeseinheitliche Praxis bei der Ueberwachung der Emissionen aus Anlagen nach Section 16 der Gewerbeordung. Hier: Richtlinien ueber die Auswertung laufend aufzeichnende Emissionsmessungen). March 1, 1973. Translated from German, 11p.*

Guidelines are given for monitoring emissions from plants which exceed the dust and sulfur dioxide emission limits of West Germany. The necessary reliability, maintenance, calibration, and measurement evaluation are discussed for the dust measurement method which measures extinction. The operational reliability, calibration, operation, and measurement evaluation are discussed for the sulfur dioxide measurement method.

40031 **APTIC NO. 6103[illegible]**

Ministry of Public Health (USSR)

INDIVIDUAL REPORTS. *1973 (?). Translated from Russian, 18p.*

Maximum permissible values are listed for the USSR for maximum single and daily average values for various substances including freon, amines, benzopyrene, alcohol, and ethylene sulfide as of Feb. 16, 1973. A similar list of the maximum permissible concentrations of harmful substances in the air of populated areas is given for Jan. 11, 1971, including nitrogen dioxide, acrolein, ammonia, acetone, benzene, butylene, butyl alcohol, dimethyl sulfide, manganese, propylene, nontoxic dust, soot, mercury, lead, sulfuric acid, hydrogen sulfide, carbon sulfide, styrene, carbon monoxide, carbon tetrachloride, fluorine compounds, chlorine, ethylene, and many other substances. Maximum allowable concentrations for a combination of substances such as acetone and phenol, sulfur dioxide and nitrogen dioxide, SO2 and hydrogen fluoride, and many other combinations are also discussed. Maximum permissible concentrations of harmful substances in the water of reservoirs destined for sanitary and residential use are listed.

40032 **APTIC NO. 62155**

Pollution Research and Prevention Center

ESTABLISHMENT OF NITROGEN OXIDE EMISSION STANDARDS BASED ON AIR POLLUTION CONTROL LAWS. *(Taiki osen boshiho ni motozuku chisso sankabutsu no haishutsu kijun no settei nado ni tsuite). Text in Japanese. Kankocho Kogai Senmon Shiryo, (Public Nuisance Gaz.), 8(6):115-118, 1973.*

Nitrogen oxides were labeled as harmful substances by the government in June, 1971. They were listed as special harmful substances since there was no effective control method. A new law, which has dropped NOx as a special harmful substance, was issued on Aug. 10, 1973 due to the improvement of combustion methods and NOx control techniques. Emission standards are given in the new law for facilities which discharge large quantities of NOx, and for those which emit flue gas with high NOx concentration and for which control techniques are available, such as boilers and nitric acid manufacturing facilities. The emission standards for boilers were established based on the facts that the emission concentration can be reduced 30 to 40% by using two-stage combustion and flue gas recycling, and by the improvement of burners. These same factors were also considered for the establishment of the standard for heating furnaces. The emission standards for nitric acid manufacturing facilites were established based on the premise that apparatus are equipped such that at least 90% of the substances can be removed.

1972

40033 **APTIC NO. 61026**

Council of Ministers (USSR), State Committee for Construction

SANITARY NORMS FOR INDUSTRIAL ENTERPRISE DESIGN. *(Sanitarnyye normy proyektirovaniya promyshlennykh predpriyatiy). 1972. Translated from Russian, 89p.*

Sanitary standards in the USSR for industries are discussed. The standards limit the emission of odors or harmful dusts and gases, as well as noise, vibration, ultrasonics, radiation, and other harmful effects. Requirements for construction site selection and for layout design and for industrial buildings and structures are discussed. The requirements for auxiliary buildings and rooms, heating, ventilation, air conditioning, water supply, sewage, lighting, and ultraviolet illumination are also reviewed. Chemical industries are required to have a 1000 m protective zone, a 500 m zone, a 300 m zone, a 100 m zone, or a 50 m zone, depending on the type of plant. Metallurgic, machine-building, and metal processing plants are required to have similar zones. Mining industries must have 100, 500, 300, or 100 m zones, depending on type of mine. The building industry, wood processing industry, textile, animal-product processing industry, food processing industry, thermal power stations and boiler houses, sanitary engineering facilities, sewage treatment facilities, and agricultural enterprises also have safety zones which are described. The maximum allowable concentrations of harmful substances in the air of populated areas [illegible] listed for various substances such as ammonia, acrolein, acetone, benzene, methyl mercaptan, arsenic, soot, mercury, hydrogen sulfide, carbon disulfide, carbon monoxide, formaldehyde, chlorine, and other substances. Combinations of harmful substances which have a combined effect are also listed. The maximum allowable concentrations of harmful substances in the air of a work zone are also listed. The maximum allowable concentration of aerosols of primarily fibrogenic action are listed. Standards are listed for the air temperature, humidity, and speed of air movement inside industrial zones. Maximum allowable concentrations of harmful substances in the water or reserviors, allowable levels of sound in work areas, and allowable levels of vibration are also listed.

LEGAL AND ADMINISTRATIVE

1974

40034 **APTIC NO. 61760**

Alm, Alvin L.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. MASSACHUSETTS; APPROVAL OF PLAN REVISION. *Federal Register, 39(86):15272, May 2, 1974.*

A variance to the Massachusetts air quality implementation plan is approved by the Environmental Protection Agency for the Salem Harbor power plant which has been urged for energy shortage reasons to convert from oil to coal. The Massachusetts Department of Public Health also approved the conversion of this plant to burn coal with a sulfur content not in excess of 2.5% and an ash content not in excess of 15%. A preliminary EPA analysis on coal conversions indicates that the Salem Harbor plant should be able to convert to coal without causing a significant environmental hazard for the time period considered. Conditions are listed to which the approval is subject.

40035 **APTIC NO. 62561**

Bartlett, Robert C.

ENVIRONMENTAL IMPACT STATEMENTS: AVAILABILITY OF EPA COMMENTS. *Federal Register, 39(89):16183-16186, May 7, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment during the period of April 1, 1974 and April 15, 1974. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing during this review period. The list includes the Federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA s comments as defined in Appendix II, and the EPA source for copies of the comments as set forth in Appendix V. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing during this reviewing period. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and other proposed actions.

40036 **APTIC NO. 62794**

Berindan, Cornelia

RELATIONS BETWEEN URBAN STRUCTURE AND THE SITING OF SAMPLING STATIONS. *(Relations entre la structure urbaine et l emplacement des reseaux de prelevement). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 7-1- 7-7, 8 refs. (May 8-10.)*

General problems of the siting of air pollution monitoring stations as a function of the urban structure are described. In urban and industrialized urban areas, the natural surface relief is complicated by the anthropogenic relief constituted by buildings and other surface-modifying elements. These give a highly complex surface pattern and strongly modify the pollutant dispersion processes, leading to local islands of high pollutant concentrations. In urban areas, the air pollution monitoring stations should be sited as a function of the urban structure and of the site of industrial emission sources. It is not sufficient to determine the optimum number and mutual distance of the individual sampling stations. The surface roughness of urban areas increases the need for more monitoring stations.

40037 **APTIC NO. 62584**

Hishida, Kazuo

THE FUTURE OF NITROGEN OXIDES CONTROL. *(NOx kisei no shorai shorai). Text in Japanese. Preprint, Japan Management Assoc., p. 15-39, June 1974. (Presented at the Japan Management Association National Conference of Pollution Control Techniques, Tokyo, Japan, June 10-14, 1974, Paper 8.)*

The schedule for the development of pollution control measures with 1977 as the targe year was published by the Tokyo Metropolitan Government in April 1974. The target values for sulfur oxides, nitrogen oxides, suspended particulates, carbon monoxide, hydrocarbons, photochemical oxidants, lead, and odors and possible control measures are discussed in detail. The standard NOx was set at 0.015 ppm (annual average). The total emission of NOx in metropolitan Tokyo was 96,000 tons in 1972, 70% from the non-stationary sources and 30% from stationary sources. The regional distribution map and data compiled on the pollutant concentrations are given in tabular forms and diagrams. The average nitrogen dioxide concentrations in 1972 were 0.038 ppm in the congested high-rise building district, 0.035 ppm in industrial district, and 0.034 and 0.036 ppm in two residential areas, indicating wide spread NO2 pollution. The annual average taken from 1965 to 1972 showed a slight increase or remained unchanged until 1972 when a decreasing trend was observed. The seasonal pattern of lower NO2 concentration from spring to summer and high concentration from fall to winter was common in all areas. The annual average of NO showed a slight increasing trend. Based on the information compiled, the target values for each pollutant concentration and target years were determined. The number of days with NO2 concentrations of less than 0.02 ppm is set at 80% of the year by 1977 and 100% by 1980. The acceptable emission level and extent of necessary reduction for the attainment of target values for each pollutant are given.

40038 **APTIC NO. 62795**

Klein, F., P. Motsch, A. Ranty, B. Boury, and J. C. Filler

THE APPLICATION OF MULTIDIMENSIONAL STATISTICAL ANALYSIS TO AIR POLLUTION DATA PROCESSING. *(Une application de l analyse statistique multidimensionnelle au traitement des donnees en pollution atmospherique). Text in French. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluces, 11th, Paris, France, 1974, p. 9-1-9-10, 5 refs. (May 8-10.)*

The Pearson-Hotelling multidimensional multivariate statistical analysis and its application to the processing of air pollution measurement data supplied by a monitoring network are described. The multivariate statistical analysis was applied to the determination of the responsibilities of definite emission sources for air pollution as a function of the meteorological conditions and of the operating conditions. Correlation factors between pollutant levels and meteorological conditions were determined on the basis of the pollution and meteorological data supplied by an air pollution monitoring network at the IRSID metallurgic complex at Maizieres-les-Metz, which includes sampling stations for dustfall, dust, and sulfur dioxide concentration measurement. The multivariate statistical analysis permits simple, clear, graphic presentation of the data.

40039 **APTIC NO. 60266**

Kobuta, Torahide and Tsunehiro Yajima

ADVANTAGE IN INTRODUCTION OF TOTAL EMISSION REGULATION AND ACTUAL WORKING SITUATION OF FLUE GAS DESULFURIZATION FACILITIES. *(Soryo kisei donyu ni okeru riten to haien datsuryu sochi no jitsudo jokyo). Text in Japanese. Kagaku kojo (Chem. Factory), 18(4):79-82, April 1974.*

Regional sulfur oxides pollution concentration can be controlled to presently accepted levels if the emission standard for each factory in a region is based on the overall allowable concentration for that region. Regional limits should not be changed when new sources are built. The number and distribution of stack gas desulfurization installations in Japan are discussed.

40040 **APTIC NO. 61941**

Lersner, Heinrich Freiherr von

THE FEDERAL BUREAU FOR THE ENVIRONMENT - ORGANIZATION AND TASKS. *(Das Umweltbundesamt - Aufbau und Aufgaben). Text in German. Muell und Abfall, 6(1):1-5, 1974.*

The Federal Bureau for the Environment will be located in West Berlin. It will have three departments. The first one will deal with general questions concerning the environment, will store information on publications and data, and will be able to pinpoint the location of specialized documentation in the field. The second department concerns emission protection and will have to deal with three major tasks: the conservation of clean air, combating noise and vibrations, and the establishment of air and noise quality standards. Four groups will be assigned to deal with the conservation of clean air. One group will occupy itself with process engineering, and the second with control equipment. This group will also be concerned with the urgent task of decontaminating automobile exhausts. Two more groups, concerned with monitoring and measurement techniques, will have to study the relationships between emission and immission with regard of the atmospheric and meteorological conditions and will have to develop measurement and control methods. Beginning January 1, 1974, the air monitoring grid operated in the past by the Deutschen Forschungsgemeinschaft will be the concern of these two groups. The grid will be extended over the entire FRG. The pilot station will remain in Frankfurt. The third department will be concerned with recycling and disposal of all kinds of liquid and solid waste.

40041 **APTIC NO. 62565**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. AVAILABILITY OF AGENCY COMMENTS. *Federal Register, 39(80):14539-14541, April 24, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in the following appendices during the period off March 16, 1974 and March 31, 1974. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing during this review period. The list includes the Federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA s as defined in Appendix II, and the EPA source for copies of the comments as set forth in Appendix V. Appendix III contains a listing of final environmental impact statements handled during this reviewing period. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and other proposed actions.

40042 **APTIC NO. 62503**

Miyazaki, I.

AIR POLLUTION AND POLLUTION PREVENTION ORDINANCE IN KAWASAKI CITY. *(Kawasaki-shi no taiki osen to kogai boshi jorei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(3):277-286, March 1974.*

The history of civilian movements against air pollution in Kawasaki (which is famous as one of the most dirty industrial cities in Japan) is described. There have been many air pollution problems since Kawasaki decided to introduce many factories into the city in 1877. Suzuki Co. has emitted hydrogen chloride gas and caused damages to plants around the factory.

Asano Cement Co. has emitted cement powders since 1924. Tsurumi Seitetsu Co. emitted sulfur dioxide in 1973. Against these pollutions, the government set laws for factory control in 1938. After the second World War, the air pollution in this city started to increase in 1950. The red smoke problem caused by Nippon Kokan Co. started in 1961. The government set laws for smog control in 1962. Sulfur dioxide concentration in Kawasaki Daishi area reached 0.115 ppm in 1967. After establishing a progressive city government in 1971, the bureau of pollution control and the measuring center for pollutants were established. The Kawasaki protection rule was set in 1972, and is more strict than the similar rule by the government. The Committee for Environmental Pollution Measures in this city started in 1972.

40043 **APTIC NO. 62791**

Muckli and Weber

STANDARDIZATION OF AUTOMATIC AIR POLLUTION MONITORING NETWORKS. *(Standardisierung von automatischen Immissions-Messnetzen). Text in German. Inst. National de Recherche Chimique Appliquee, Paris (France), Proc. Colloq. Int. Atmos. Polluees, 11th, Paris, France, 1974, p. 4-1-4-10. (May 8-10.)*

A proposal for the standardization of automatic and semi-automatic air pollution monitoring networks is presented. Standardization should relate both to the siting of monitoring stations, the use of interchangeable modular units, data transmission, data processing, and documentation. The standardization of air pollution monitoring networks will facilitate comparison of measurement data from different networks, the compatibility and smooth cooperation of instruments by different manufacturers, and the planning of new monitoring networks.

40044 **APTIC NO. 61769**

Muramatsu, Satoru

PRESENT SITUATION OF INDOOR AIR POLLUTION FROM THE VIEW OF BUILDING ENVIRONMENTAL SANITATION AND HEALTH ACT. *(Birukanriho kara mita birukankyo no genjo). Text in Japanese. Preprint, Japan Air Cleaning Assoc., Tokyo, p. 27-44, 1974. 14 refs. (Presented at the Technical Training Conference on Air Cleaning, 12th, Tokyo, Japan, March 27, 1974.)*

The construction standards law and its enforcement regulations, as well as the labor standards law, has been partially revised to provide standards for indoor environmental sanitation and health. The new building environmental sanitation control standards comprise the provisions for indoor environmental air standards, control of water supply and effluents, disposal of waste matters, prevention and elimination of rats and other pests, and cleaning of a building. The sanitation and health act applies to all buildings with total floor space measuring 5000 sq m or more. The number of such buildings in Tokyo is estimated to be 1641, of which office buildings account for 58%, school buildings for 17%, and store buildings for 9%. Under the act, a qualified building management technician must be appointed to take care of environmental sanitation controls in such a building. The standard job description of this technician is given in full. Dust concentrations were measured by high- and low volume samplers, dust meters, and dust counters, and correlations among the measurements noted.

40045 **APTIC NO. 61765**

Murase, A.

METHODS OF TOTAL AIR POLLUTION VOLUME CONTROL IN KAWASAKI CITY. *(Kawasaki-shi ni okeru taiki osen soryo kisei no shuho). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 11(7):14-22, Jan. 1974.*

Kawasaki City established its pollution control regulation in March, 1972, determining maximum allowable concentrations and emission standards for sulfur oxides and aerosols. For SOx, an hourly concentration of less than 0.10 ppm and a 24-hour average of less than 0.05 ppm must be simultaneously maintained. According to a survey made in July, 1971, 129,000 tons of SOx were discharged in 1970, 92% of which attributable to combustion of fuels (mainly heavy oil) containing sulfur, and the rest from sintering iron ore. Dividing the city by grids of 4 sq km, the grid which discharged more sulfur oxides indicated higher concentration. Using a diffusion model and taking into consideration effects of wind direction and stack height, the relationship between sulfur oxides concentration and effective pollution load was established in a formula from which it was possible to calculate a marginal discharge volume. Twenty four- hour averages of 0.05 ppm gives an annual average of 0.012 ppm. However, intermediate standards for three areas have been determined, one set for after 1974 and the other for after 1976. The former is 0.040, 0.030, and 0.012 ppm; and for the latter, 0.030, 0.030, and 0.012 ppm, respectively. For some specific plants, a special discharge standard may have to be applied.

40046 **APTIC NO. 62483**

Myers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS: AVAILABILITY OF AGENCY COMMENTS. *Federal Register, 39(100):17995-17997, May 22, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in appendices herein during the period of April 16, 1974 and April 30, 1974. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing during this review period. Appendix II contains the definitions of the classification of EPA s comments on the draft environmental impact statements as set forth in Appendix I. Appendix III contains a listing of final environmental impact statements reviewed and commented on in writing during this review period. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and other proposed actions. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments listed in Appendices I, III, and IV.

40047 **APTIC NO. 62426**

Patricios, N. N.

ENVIRONMENTAL EFFECTS AND THE PLANNING OF URBAN TRANSPORTATION SYSTEMS. *Civ. Eng. S. Afr./Sievel Ing. S. Afr., 16(2):69-72, Feb. 1974.*

The concept of urban freeways is reviewed, the reason for the growing opposition to this form of highway is described, deleterious effects of freeways are discussed, and the environmental approach to planning and designing freeways in urban areas is described. New highway construction is being resisted on the grounds of the costs of solving the resulting traffic pollution and congestion. Deleterious effects from traffic movement are noise, pollution, and vibration. The physical aspects of urban freeways also cause deleterious effects such as displacement of people and activities, severance of existing communities, visual problems, and loss of privacy and sunlight. Urban freeways must be considered as an integral part of the urban structure and as part of the overall transportation/land use policy. The benefits and effects of highways must be considered during planning, and the freeways should be designed to minimize deleterious effects.

40048 **APTIC NO. 61758**

Quarles, John

THE 1976 NITROGEN OXIDE EMISSION STANDARD: APPLICATIONS FOR SUSPENSION; DECISION OF THE ADMINISTRATOR. *Federal Register, 39(82):14732-14733, April 26, 1974.*

The Environmental Protection Agency Administrator grants a 1-year suspension of the 1976 nitrogen oxide standard for light-duty motor vehicles to each of the following applicants: Automobiles Peugeot, Checker Motors Corp., Isuzu Motors Ltd., Mitsubishi Motors Corp., Toyo Kogyo Company, Ltd., SS Automobiles Inc., toyota Motor Company, Ltd., and Avanti Motor Corp. Each applicant's 1976 model year light duty vehicles sold in the United States will be required to meet an interim NOx standard of 2.0 g/mi.

40049 **APTIC NO. 61759**

Quarles, John

PUERTO RICO. IMPLEMENTATION PLANS; APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(93):17109-17110, May 13, 1974.*

Implementation plan compliance schedules submitted for approval by the Environmental Protection Agency for Puerto Rico in connection with the attainment and maintenance of national ambient air quality standards are listed. Information for 47 sources is given by location, regulations involved, date of adoption, effective data, and final compliance date. None of the compliance dates fall beyond the April 30, 1975 date established in Puerto Rico's implementation plan for attainment of primary ambient air quality standards.

40050 **APTIC NO. 61761**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. CALIFORNIA TRANSPORTATION CONTROL PLAN. *Federal Register, 39(92): 16887-16888, May 10, 1974.*

An amendment to the gasoline transfer vapor control regulation 52.255(c) is included in the Transportation Control Plans for five Air Quality Control Regions in California to correct an error made in the promulgation by the Environmental Protection Agency. As published, a 1-year exemption was given to small bulk plants if more than 90% of the daily volume transferred was to storage tanks requiring vapor recovery; as amended, and originally intended, a 1-year exemption is allowed to small bulk plants if less than 10% of daily volume transferred is to storage tanks requiring vapor recovery.

40051 **APTIC NO. 61813**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEW HAMPSHIRE: APPROVAL OF PLAN REVISION. *Federal Register, 39(67):12350, April 5, 1974.*

Revisions to the approval and promulgation of implementation plans for New Hampshire are discussed. States were required to devise and initiate plans to prevent, to the greatest degree possible, any detrimental air pollution effects that might result from a probable low-sulfur fuel shortage during the winter of 1973-1974. Among the measures recommended was the formulation of a comprehensive variance plan for sulfur content in fuel regulations. The revision to the New Hampshire implementation plan which sets forth procedures for granting variances to any source to burn up to 2.5% S fuel with the stated exception was approved for 120 days beginning Dec. 12, 1973, subject to certain specified conditions.

40052 **APTIC NO. 61815**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. RECALL REGULATIONS. *Federal Register, 38(58): 11103-11108, March 25, 1974.*

A regulatory scheme for the control of air pollution from new motor vehicles and new motor vehicle engines is proposed. The recall regulations provide a method of carrying out Section 207c of the Clean Air Act. The section requires the manufacturer of any class or category of vehicles or engines which do not conform to the regulations under section 202 to submit a plan for remedying the nonconformity. The manufacturer may request a public hearing to contest the determination of nonconformity. Unless, as a result of such hearing, the determination is withdrawn, the manufacturer must give dealers and ultimate purchasers notice of the nonconformity. The Administrator is authorized to promulgate regulations to prescribe the content of the notification and the manner in which it is given. The manufacturer is required to establish and maintain such records as are necessary to ensure that the manufacturer is in compliance with the regulations.

40053 **APTIC NO. 61816**

Quarles, John

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. ASBESTOS, BERYLLIUM, AND MERCURY. *Federal Register, 39(87):15396- 15398, May 3, 1974.*

Revisions are issued to clarify the national emission standards for the hazardous air pollutants asbestos, beryllium, and mercury. The revisions are necessary to advise the public of how the regulations are being interpreted in the enforcement activities of the Environmental Protection Agency. The revisions do not alter the stringency of the regulations. The following terms are defined: alternative method, asbestos mill, manufacturing, commercial asbestos, and demolition. Procedures to follow in the case of demolition are listed.

40054 **APTIC NO. 61817**

Quarles, John

MOTOR VEHICLE EXHAUST EMISSION RETROFIT DEVICES. VOLUNTARY RETROFIT EVALUATION PROGRAM. *Federal Register, 39(60):11334- 11339, March 27, 1974.*

The proposed motor vehicle exhaust emission retrofit device evaluation protocols are described. Under the voluntary evaluation program, developers or marketers of individual retrofit emission control devices would arrange for independent testing laboratories to examine their devices according to procedures published by the Environmental Protection Agency. Such testing would be at the expense of the device proponent. The EPA would maintain cognizance over such testing programs, and would evaluate and confirm the results in its own laboratory as necessary. The results of all evaluation under the program would be published by the EPA for use by states and other interested parties. The program does not include test procedures suitable for the evaluation of fuels, fuel additives, refueling loss retrofit devices, or evaporative emission control retrofit devices. Public comment on the proposed protocols is invited.

40055 **APTIC NO. 61818**

Quarles, John

U. S. VIRGIN ISLANDS IMPLEMENTATION PLAN. PROPOSED REVISION. *Federal Register, 39(69):12872, April 9, 1974.*

The proposed revision of the U. S. Virgin Islands Implementation Plan is announced. All state implementation plans were disapproved on March 8, 1973 insofar as the plans did not contain adequate procedures to prevent the construction and modification of indirect sources of air pollution if the maintenance of a national standard is threatened. The Virgin Islands has submitted for approval two revisions to its plans consisting of new regulations: Review of New Sources and Modifications and Review of New or Modified Indirect Sources. Public comment is invited.

40056 **APTIC NO. 61820**

Quarles, John

APPROVAL AND PROMULATION OF IMPLEMENTATION PLANS. REVISIONS TO ILLINOIS, INDIANA, MICHIGAN, MINNESOTA AND WISCONSIN; CORRECTIONS. *Federal Register, 39(68):12769-12771, April 8, 1974.*

An errata sheet for incorrect listings in the February 19, 1974 publication is presented. The listing covered several revisions to the State plans for implementation of the national ambient air quality standards for the States of Illinois, Indiana, Michigan, Minnesota, and Wisconsin.

40057 **APTIC NO. 61848**

Quarles, John

FUELS AND FUEL ADDITIVES. PROPOSED RESTRICTIONS ON USE OF UNLEADED GASOLINE. *Federal Register, 39(71):13174-13179, April 11, 1974.*

Proposed revisions to Section 80.23 which sets forth the conditions under which retailers and suppliers will be deemed in violation of the prohibition against introducing leaded gasoline into a vehicle requiring unleaded gasoline are presented. The proposal would qualify the liability of branded refiners for violations caused by illegal acts and for certain violations occurring in the jobber distribution chain. A branded refiner would not be deemed in violation if he shows that the violation was not caused by him or his employee or agent, and if he demonstrates that the violation was caused by an act in violation of law. This provision could be invoked in cases of sabotage, fraud, commingling, or other illegal conduct by any retailer or distributor resulting in a violation of the regulations. A branded refiner would also not be deemed in violation if he could show that the unleaded gasoline offered at a retail outlet supplied by a jobber whose facilities are not owned, leased, or controlled by the refiner was not in compliance due to a violation of a contractual undertaking between the reseller and the refiner designed to prevent such a violation and despite the refiner's reasonable efforts to insure compliance with such contractual undertaking. Reasonable efforts by a refiner might consist of a periodic sampling program to test unleaded gasoline distributed through jobbers.

40058 **APTIC NO. 61849**

Quarles, John

FEDERAL CONTRACTS, GRANTS, OR LOANS. ADMINISTRATION OF THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT. *Federal Register, 39(58):11099-11102, March 25, 1974.*

A proposed revision to the administration of the Clean Air Act and the Federal Water Pollution Control Act with respect to Federal contracts, grants, or loans is presented. The primary purpose of the program is to ensure that facilities in noncompliance with clean air and water standards are not utilized for Federal contracts, grants, or loans. The program provides for the establishment of a List of Violating Facilities which will reflect those ineligible for the award of a Federal contract, grant, or loan. Facilities will be listed upon a determination by the Environmental Protection Agency of continuing or recurring noncompliance with clean air or water standards. Federal, State, and local criminal convictions, civil adjudications, and administrative findings of noncompliance may serve as a basis for consideration of listing. The program shall apply to any contract, grant, or loan in excess of $100,000 as well as any contract of a lesser amount involving a facility giving rise to a Federal criminal conviction.

40059 **APTIC NO. 61867**

Quarles, John

KENTUCKY. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(54):10277-10278, March 19, 1974.*

The indirect source review provision of the Kentucky Implementation Plan is presented. The regulation requires that State approval bo obtained prior to construction or modification of specified sources or classes of sources. New indirect sources include enclosed and unenclosed parking facilities for certain parking capacities; any source which induces an additional 2000 or more vehicle trips/hr in an existing roadway; airports served by a regularly scheduled commercial air carrier; and new or modified roads located in one of the standard metropolitan statistical areas identified by the U. S. Bureau of the Census or in a country with a city of 20,000 or more inhabitants, and expected to have within 10 yr a traffic volume of 2000 or more vehicles per hour.

40060 **APTIC NO. 61868**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. CORRECTIONS AND REVISIONS TO THE NEW JERSEY TRANSPORTATION CONTROL PLAN. *Federal Register, 39(65):12101-12102, April 3, 1974.*

Corrections and revisions to the previously published New Jersey transportation control plan are presented. Section 52.1599 is being corrected to extend its applicability to the New Jersey portion of the Metropolitan Philadelphia Interstate Region. The correct reading of paragrah (d) is presented and as corrected will require a vapor-tight return line from the fill nozzlefiller neck interface to the dispensing tank, or to an adsorption, absorption, incineration, refrigeration-condensation system or equivalent. Revisions in the New Jersey plan consist of changing the dates of required compliance for a number of provisions.

40061 **APTIC NO. 61869**

Quarles, John

COLORADO. PROPOSED REVISIONS TO TRANSPORTATION CONTROL PLAN. *Federal Register, 39(58):11102-11103, March 25, 1974.*

Proposed revisions to the Transportation Control Plan for Colorado on Stationary hydrocarbon regulations are presented. The revision is called Colorado Regulation 7 and includes regulations similar to the Environmental Protection Agency promulgated regulations, but does not require vapor recovery for gasoline marketing operations or for filling service station tanks or for filling of vehicular tanks. The regulation would allow as much as 1.5 lb of hydrocarbon vapors to be emitted/1000 gal loaded. Regulation 7 does not require control consistent with three EPA regulations, which cover sources accounting for almost half of the stationary source hydrocarbon emissions. The public is invited to submit written comments of whether the proposed revisions should be approved or disapproved.

40062 **APTIC NO. 62463**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: APPROVAL OF VARIANCE FOR STATE OF MASSACHUSETTS. *Federal Register, 39(99): 17839-17840, May 21, 1974.*

A variance has been granted to allow the New England Power Co. to use coal with a maximum sulfur content of 2.5% and a maximum ash content of 15% in unit No. 3 at the Company's Brayton Point Generating Station in Somerset, Mass. from May 4, 1974 to Dec. 31, 1974. This variance is issued providing the Company report to the Environmental Protection Agency on its efforts to obtain higher quality coal, meet the mass emission limitation for particulates, install an ambient air monitoring system for sulfur oxides and particulates, submit plans for a sulfur oxides removal system for Unit 3, and submit reports on the availability of low sulfur coal.

40063 **APTIC NO. 62466**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: MISCELLANEOUS AMENDMENTS. *Federal Register, 39(101):18075-18088, May 23, 1974.*

A number of technical amendments to regulations concerning the control and measurement of motor vehicle emissions are presented. These include rules for evaporative emission collection procedures, dynamometer driving schedules, dynamometer procedures, sampling and analytical systems for exhaust emissions, recording of information, sampling and analytical systems for fuel evaporative emissions, analytical system calibration and sample handling, calculations for exhaust emissions, test engines, and certification.

40064 **APTIC NO. 62467**

Quarles, John

STATE OF WASHINGTON PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(97):17566, May 17, 1974.*

Revisions to the compliance schedules contained in the implementation plans of the national ambient air quality standards of the Clean Air Act for Washington are proposed. The companies concerned are the Boise Cascade Corp., Inland Empire Pea Growers, Long Lake Lumber, Mutual Materials, and Weyerhauser.

40065 **APTIC NO. 62468**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISION FOR STATE OF CONNECTICUT. *Federal Register, 39(74):13651, April 16, 1974.*

Due to the fuel shortage variances from the Connecticut National Ambient Air Quality Standards have been approved concerning the burning of high sulfur fuel by power companies. Provisions to these variances include that the companies strive to obtain fuel containing the lowest possible sulfur, install sulfur dioxide monitoring networks, maintain a supply of low sulfur fuel in case of air pollution episodes, extend their energy conservation programs, fund research to evaluate stack gas cleaning devices and processes, be prepared to handle emergency episodes, and submit surveys of their facilities for consideration of the suitability of installing stack gas cleaning devices.

40066 **APTIC NO. 62469**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN: PENNSYLVANIA REVISION. *Federal Register, 39(89):16123, May 7, 1974.*

Revisions of an implementation plan for the National Ambient Air Quality Standards for Pennsylvania are outlined. The granting of variances with regard to the rules for distribution of low sulfur fuels is discussed, especially with regard to the current fuel shortage. The Atlantic Richfield Company of Philadelphia was granted a variance to sell fuel oil with a maximum sulfur content of 1.25% by weight for a period extending from Feb. 1, 1974 to May 31, 1974. Because of the emergency nature of the fuel shortage the requirements of public notice were suspended in this case.

40067 **APTIC NO. 62470**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISIONS FOR ALABAMA. *Federal Register, 39(79): 14338-14339, April 23, 1974.*

Approved revisions to Alabama air pollution control regulations are outlined. These pertain to emission limits for incinerators, kraft pulp mills, boilers, primary aluminum plants, hydrocarbons, and visible emissions from motor vehicles. Tampering with emission control devices on vehicles is prohibited. Administrative responsibilities are assigned to Jefferson County, Mobile County, and Hunstville.

40068 **APTIC NO. 62471**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: UTAH. *Federal Register, 39(74):13673-13676, April 16, 1974.*

Amendments to regulations of the Clean Air Act concerning emission standards for particulate matter from process sources and by-product coke ovens and the Federal Compliance Schedule in Utah are proposed. Specific amendments for the United States Steel Geneva Plant and the Kennecott Copper Utah Smelter are presented.

40069 **APTIC NO. 62472**

Quarles, John

REGULATION OF FUELS AND FUEL ADDITIVES. AVAILABILITY OF UNLEADED GASOLINE. *Federal Register, 39(89):16123-16126, May 7, 1974.*

Section 80.22(b) of the regulations concerning unleaded gasoline provides that after July 1, 1974, every owner or operator of a retail outlet at which 200,000 or more gallons of gasoline were sold during any calendar year beginning with the 1971 calendar year shall offer for sale at least one grade of unleaded gasoline. Section 80.22(c) provides that every owner or operator of six or more retail outlets shall offer for sale at least one grade of unleaded gasoline at no fewer than 60% of such outlets after July 1, 1974. On Oct. 12, 1973, an amendment was proposed to the aforementioned regulations to delete section 80.22(c) and retain section 80.22(b) as the sole availability requirement for unleaded gasoline. This amendment is adopted.

40070 **APTIC NO. 62475**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISION FOR STATE OF MASSACHUSETTS. *Federal Register, 39(79):14338-14339, April 23, 1974.*

Due to the energy shortage the Mt. Tom electric power facility and the West Springfield electric power facility asked for variances from section 110 of the Clean Air Act in order to burn coal. The variance was approved for the Mt. Tom facility but not for West Springfield. Provisions of the variance granted included that the company report to the Environmental Protection Agency periodically on the state of its fuel supply and that the coal burned be of the lowest sulfur and ash content available and never greater than 2.5% sulfur and 15% ash.

40071 **APTIC NO. 62489**

Quarles, John

AUTOMOBILI FERRUCCIO LAMBORGHINI: 1976 NITROGEN OXIDE STANDARD SUSPENSION REQUEST; NOTICE AND PROCEDURES FOR DISPOSITION. *Federal Register, 39(99):17883-17884, May 21, 1974.*

On April 26, 1974 an application for suspension of the 1976 nitrogen oxides standard was received from Automobili Ferruccio Lamborghini. The procedures for disposition of this application are as follows. The applications will be made available for public review and comment. The Administrator will conduct a public hearing, if, on the basis of public comments received, he determines a useful purpose would be served thereby. Each application will be reviewed by the Environmental Protection Agency to determine whether the applicant made all good faith efforts. If any application is deemed deficient the applicant will be notified by EPA to supplement his suspension request and, if the applicant fails to satisfactorily revise the application, the applicant will be required to appear and testify at a public hearing. The Administrator will issue by Federal Register notice his decision to grant or deny the respective applications on or before the 60th day from the day of receipt of such applications.

40072 **APTIC NO. 62491**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: PROPOSED REVISION OF RHODE ISLAND PLAN. *Federal Register, 39(81): 14614-14615, April 25, 1974.*

Notice is issued setting forth a regulation for source recordkeeping and reporting, in the form of the Rhode Island regulation, as proposed rulemaking and public comments may be substituted as to whether it meets the requirements of the Clean Air Act. As proposed, the regulation requires all emission sources, with the exception of one-, two-, or three-family dwellings, to maintain records at the request of the Administrator or the Director of Health and to submit data necessary to determine if the source is in compliance with applicable state regulations. Information obtained from these sources will be correlated with emission limitations for each source and made available for public inspection. Reporting periods are from January 1 through June 30, and July 1 through December 31 of each year. All information will be reported to the Director of Health within 45 days of the end of each period.

40073 **APTIC NO. 62495**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: PROPOSED COMPLIANCE SCHEDULES FOR PENNSYLVANIA. *Federal Register, 39(80): 14520-14521, April 24, 1974.*

Pennsylvania has submitted, for the Environmental Protection Agency s approval, revisions to the compliance schedule portion of its plan for implementation of thethe Clean Air Act. This publication proposes that certain of these revisions be approved. Others are still undergoing review and cannot be proposed for approval at this time. Each proposed revision established a date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. This date is indicated in the attached table under the heading Final Compliance Date. In many cases, the schedule includes incremental steps toward compliance with interim dates for achieving those steps. All of the compliance schedules are available for public inspection.

40074 **APTIC NO. 62563**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. HAWAII: APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(90):16348-16349, May 8, 1974.*

Revisions to the compliance schedule portion of the approved plan for implementation of the national ambient air quality standards of the Clean Air Act in Hawaii have been submitted for approval by the Environmental Protection Agency. Twenty-eight of these have been found to satisfy legal requirements and to be consistent with the approved control strategy. Each compliance schedule revision establishes a new date by which an individual source must comply with an emission limitation specified by the implementation plan. In each case, the schedule includes incremental steps towards compliance.

40075 **APTIC NO. 62564**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEVADA; APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(78):14208-14209, April 22, 1974.*

Revisions to the compliance schedules for implementation of the Nevada plan for national ambient air quality standards under the Clean Air Act were submitted to the Environmental Protection Agency on Feb. 15, 1973 and Aug. 13, 1973. Seventeen compliance schedules were submitted. Ten were proposed for approval and six were proposed for disapproval. Review of the compliance schedule for the Kennecott Copper Corp., Nevada Mines Div., is pending the results of a hearing to consider granting a 1-year postponement. The schedules disapproved include those of Jack N. Tedford, Inc., Duval Corp., U. S. Gypsum Corp., Basic, Inc., and Southern California Edison Co.

40076 **APTIC NO. 62566**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: SOUTHWEST PENNSYLVANIA AQCR, GASOLINE TRANSFER VAPOR CONTROL. *Federal Register, 39(73):13542-13543, April 15, 1974.*

Gasoline transfer vapor control regulations applicable to gasoline transfer operations in the Allegheny County portion of the Southwest Pennsylvania Intrastate Air Quality Control Region have been promulgated by the Environmental Protection Agency. As a result of comments submitted by the Associated Petroleum Industries the regulation is being amended to indicate that the restriction against reloading a delivery vehicle at facilities not equipped with the specified vapor recovery system applies only to reloading within the Southwest Pennsylvania Intrastate Air Quality Control Region.

40077 **APTIC NO. 62567**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: OHIO. *Federal Register, 39(73):13539-13542, April 15, 1974.*

As a result of litigation, the Governor of Ohio withdrew from the proposed Implementation Plan for the Control of Suspended Particulates, Sulfur Dioxide, Carbon Monoxide, Hydrocarbons, Nitrogen Dioxide, and Photochemical Oxidants in the State of Ohio the control strategy and regulations for control of sulfur oxides. A new control strategy to achieve national standards for sulfur oxides will be submitted by the Governor of Ohio in the near future. Upon submission, the plan will be published as proposed rule-making for public comments prior to final approval or disapproval. Public Comments on the plan are outlined.

40078 **APTIC NO. 62571**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: PROPOSED COMPLIANCE SCHEDULES FOR WEST VIRGINIA. *Federal Register, 39(84):15050-15051, April 30, 1974.*

Revisions to the compliance schedule of the implementation plan for the attainment and maintenance of national ambient air quality standards for West Virginia were submitted to the Environmental Protection Agency for approval. This publication proposes that certain of these revisions be approved. Others are still undergoing review and cannot be proposed for approval at this time. Each proposed revision established a date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. In many cases, the schedule includes incremental steps toward compliance with interim dates for achieving those steps. This notice is issued to advise the pub[illegible] that comments may be submitted on whether the proposed re[illegible]sions should be approved or disapproved.

40079 [illegible] **62573**

Quarles, John

REQUIREMENTS FOR PREPARATION, A[illegible]PTION, AND SUBMITTAL OF IMPLEMENTATION PLANS. MAINTENANCE OF NATIONAL AMBIENT AIR QUALITY STANDARDS. *Federal Register, 39(90):16343-16344, May 8, 1974.*

The Environmental Protection Agency's Guidelines for Designation of Air Quality Maintenance Areas describes techniques which the States could use in identifying potential problem areas. These Guidelines specify that the States should analyze, as a minimum, all Standard Metropolitan Statistical Areas within their jurisdiction. The Administrator has subsequently monitored the process of problem area identification, as undertaken by the States, through contact with EPA's ten regional offices. He has been favorably impressed by the efforts that most States have been making in analyzing areas, identifying problem areas, and scheduling public hearings. It has become apparent, however, that States have been unable to submit the material required by the scheduled March 18, 1974 deadline. Consequently the Administrator decided to extend the date for State submission of the identification of potential problem areas from March 18, 1974, to May 10, 1974 and the date for EPA publication of the list of potential problem areas from June 18, 1974, to August 16, 1974. This action will result in approximately 30 to 40 States being able to hold hearings on and submit area identification material by the revised deadline.

40080 **APTIC NO. 62574**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: PROPOSED COMPLIANCE SCHEDULES FOR PENNSYLVANIA. *Federal Register, 39(84):15047-15050, April 30, 1974.*

Revisions to the compliance schedule for implementation plans for attainment of the national ambient air quality standard of the Clean Air Act have been submitted for approval to the Environmental Protection Agency by the Commonwealth of Pennsylvania. It is proposed that certain of these revisions be approved. Others are still undergoing review and cannot be proposed for approval at this time. Each proposed revision established a date by which an individual air pollution source must attain compliance with the emission limitation of the State Implementation Plan. In many cases, the schedule includes incremental steps toward compliance with interim dates for achieving those steps. This notice is issued to advise the public that comments may be submitted on whether the proposed revisions should be approved or disapproved.

40081 **APTIC NO. 62856**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. OHIO; SECONDARY STANDARDS FOR PARTICULATE MATTER. *Federal Register, 39(74):13673, April 16, 1974.*

Implementation plans to achieve secondary standards for particulate matter in the Cleveland, Youngstown, and Stuebenville regions of Ohio are announced. Studies were funded by the Environmental Protection Agency to better define the emission sources which contribute to ambient concentrations of suspended particulates. The data were utilized in a diffusion model for the Cleveland and Youngstown regions and an updated rollback calculation in the Steubenville region with the predicted results that the secondary standards for particulate matter would be achieved by May 31, 1975. Public comments are invited on whether the plans should be approved.

40082 **APTIC NO. 62857**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. ALASKA, IDAHO; PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(90):16366, May 8, 1974.*

Proposed revisions to the compliance schedules of Idaho and Alaska are announced. Copies of the proposed revisions are available and public comment is invited.

40083 **APTIC NO. 62879**

Quarles, John

APPROVAL OF PLAN REVISION FOR STATE OF MASSACHUSETTS. *Federal Register, 39(96):17442-17443, May 16, 1974.*

The approval of a revision to the Massachusetts plan implementing national ambient air quality standards is described. The revision occurred during the energy crisis, when not enough low-sulfur fuel was available to meet standards. The history of the revision is described. The revision allows the New England Power Company to burn up to 2.6% sulfur residual oil at Salem Harbor and in Units 1, 2, and 3 of its Brayton Point Station on a limited basis from Jan. 1, 1974 to May 15, 1974. The company must establish an air monitoring system and must report its source of fuel. The state and the company must make every reasonable effort to acquire low-sulfur fuel. The revised compliance schedule is given.

40084 **APTIC NO. 62880**

Quarles, John

APPROVAL OF PLAN REVISION FOR STATE OF MASSACHUSETTS. *Federal Register, 39(96):17441-17442, May 16, 1974.*

The approval of a revision to the Massachusetts State implementation plan for national ambient air quality standards is discussed. The revision was granted to limit detrimental air pollution effects brought about by the fuel shortage and shortages of low-sulfur oil. The revision allows the use of 2.2% sulfur residual fuel oil by sources rated at or above 250 times 10 to the 6th power Btu/hr until May 15, 1974, if certain conditions were met. A number of variances have been submitted in accordance with this revision, therefore 13 revised compliance schedules were approved.

40085 **APTIC NO. 62863**

Suter, T.

ACTUAL AND POSSIBLE SOLUTIONS. *(Loesungen und Loesungsmoeglichkeiten). Text in German. Schweiz. Tech. Z., no. 13:248-249, March 1974.*

Some organizational aspects of environmental protection, and especially of air and water prevention in industrial plants are described. Environmental protection in industrial plants belongs in the complex problem of plant safety, while the actual measures taken for pollution abatement are of a technical nature. With environmental protection as a general task of management, an increasing number of industrial plants in Switzerland are creating full-time or part-time jobs for employees responsible for environmental protection problems, who have to determine the environmental impacts of equipment and technologies, to inform and advise the plant employees and the public on environmental protection matters.

40086 **APTIC NO. 61814**

Train, Russell

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISION FOR PENNSYLVANIA. *Federal Register, 39(65):12102, April 3, 1974.*

Revisions to the approval and promulgation of implementation plans for Pennsylvania are discussed. States were required to devise and initiate plans to prevent, to the greatest degree possible, any detrimental air pollution effects that might result from a probable low-sulfur fuel shortage during the winter of 1973-1974. Among the measures recommended was the formulation of a comprehensive variance plan for S content in fuel regulations. A variance submitted by the Pennsylvania Department of Environmental Resources would permit the Philadelphia Electric Company to use fuel with a maximum S content of 1.25% by weight for a period extending from Jan. 1, 1974 to March 31, 1974. Another variance would permit Rohm and Haas Co. to use fuel with a maximum S content of 1.25% by weight for a period extending from Jan. 1, 1974 to April 30, 1974.

40087 **APTIC NO. 61866**

Train, Russell E.

PROPOSED COMPLIANCE SCHEDULES FOR TENNESSEE. APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 39(54):10273-10277, March 19, 1974.*

Proposed revised compliance schedule for Tennessee are presented. Each revision establishes a new data by which an individual air pollution source must attain compliance with an emission limitation of the State implementation plan. In many cases the schedule includes incremental steps toward compliance with interim dates for achieving those steps.

40088 **APTIC NO. 62562**

Train, Russell E.

ENVIRONMENTAL IMPACT STATEMENTS: STATEMENT OF POLICY. *Federal Register, 39(89):16186-16187, May 7, 1974.*

The National Environmental Policy Act of 1969 requires that Federal agencies prepare detailed environmental statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The Federal Court of Appeals have held that the Environmental Protection Agency need not prepare environmental impact statements for its environmentally protective activities. The Agency believes that preparation of environmental statements will have beneficial effects for certain of its major regulatory actions. Accordingly, the EPA has decided that, while it is not legally bound to do so, it will voluntarily prepare environmental impact statements in connection with the major regulatory actions.

40089 **APTIC NO. 62568**

Train, Russell E.

REQUIREMENTS FOR THE PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS. *Federal Register, 39(89):16122-16123, May 7, 1974.*

In light of the final reclassification of Air Quality Control Regions, the Environmental Protection Agency is now promulgating a revision of the regulations concerning nitrogen dioxide (40CFR 51.14) such that State plans for attainment of the national standard for nitrogen dioxide in Priority I AQCR s will have to include an explicit showing that the national standard will be attained. States still will be able to take credit for nitrogen oxides emission control achieved directly through the Federal motor vehicle emission standards and incidentally through transportation control measures, and, where demonstrable, indirectly through hydrocarbon emission control. Further studies of the hydrocarbon-nitrogen dioxide relationship currently are underway.

40090 **APTIC NO. 62572**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: PROPOSED REVISION TO THE COMMONWEALTH OF PUERTO RICO IMPLEMENTATION PLAN. *Federal Register, 39(84):15051, April 30, 1974.*

The Commonwealth of Puerto Rico has submitted a revision to the implementation plan for attainment of national ambient air quality standards consisting of a revised Article 6 of the Regulation for Control of Atmospheric Pollution. The revised Article 6 will allow sources to determine the maximum allowable sulfur content through use of dispersion equations. This technique takes into consideration the contribution to ground level total sulfur oxide concentration at a given receptor point when the source operates at the designed capacity of the unit and under observed applicable meteorological conditions. Regardless of the fuel sulfur content determined by use of the dispersion equation the maximum fuel sulfur content which may be used by any source cannot exceed 3.1 by weight. This notice is issued to advise the public that comments may be submitted on whether the regulatory provisions of the revised control strategy should be approved or disapproved.

40091 **APTIC NO. 62217**

Williams, Edward R. and Peter W. House

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING ECOLOGICAL CONCEPTS. (FINAL REPORT). *Chase, Rosen and Wallace, Inc., Alexandria, Va. and Washington Environmental Research Center, Washington, D. C., Environmental Studies Div., Environmental Protection Agency Contract GS-03S-38351, Order P3-01-02023, Program Element 1H1096, Rept. EPA-600/5-73-013, 350p., Feb. 1974. 27 refs.*

GPO

The State of the System (SOS) Model is the result of an attempt to develop a methodology that relates ecological concepts including regional carrying capacity to the social scientists concepts of regional growth and development, and quality of life. The SOS appears conceptually sound in its general relationships, but it should be considered at this time as only a conceptual research tool. The initial operational mode, SOS-1, was developed to investigate details of the results predicted by the theory and to explore data requirements and needs. Therefore, the results of the model runs provided are purely illustrative and should be interpreted using extreme care. Further model development into a policy analysis technique has been postponed pending the outcome of research into improved techniques for measurement of quality of life. The SOS Model began as an attempt to provide an example form of a constrictor model of the Decision Analysis System (DAS) to be used in conjunction with the General Environmental Model (GEM). During the design of the constrictor model, SOS took on a life of its own as a stand-alone model. It is intended that the latter developments of SOS should complete this development as a constrictor model within DAS as well as continue its refinements as a stand-alone analysis tool. The model, as given in the SOS-1 form, is flexible, and new data and algorithms can be substituted with relative ease. In order to maintain this ease in later, more complex versions, segmentation of its procedures into smaller modules would be useful. Such a form will increase the utility of SOS as an educational and research tool. (Author abstract)

40092 **APTIC NO. 62028**

Environmental Protection Agency, Washington, D. C., Hearing Panel

REPORT OF THE HEARING PANEL: NATIONAL PUBLIC HEARINGS ON POWER PLANT COMPLIANCE WITH SULFUR OXIDE AIR POLLUTION REGULATIONS. *112p., Jan. 1974.*

The oral and written testimony received by the EPA during the public hearing on the status of power plant compliance with sulfur oxide air pollution regulations conducted Oct. 18, 1973 through Nov. 2, 1973, is assessed. Flue gas desulfurization (FGD) technology must be installed on a large number of power plants if SOx emission requirements adopted purusant to the Clean Air Act are to be met in the 1970s. The FGD systems, when operating properly, can reduce SOx emissions by 85-50%, which is sufficient to meet most, if not all, emission requirements. However, many established SOx emission limitations will not be met by the mid-1975 compliance date of most state implementation plans and will not be met at all unless the electric utility industry makes the necessary commitments to install FGD systems where needed. Four commercially available FGD process/application combinations can be installed with the expectation of successful operability and reliability. In the approximate order of confidence, they are the Wellman-Lord system for oil, lime scrubbing for coal or oil, Wellman-Lord for coal, and limestone scrubbing for coal or oil.

40093 **APTIC NO. 62131**

Tokyo Metropolitan Government (Japan)

AN OUTLINE FOR THE PROGRAM TO PROTECT TOKYO CITIZENS FROM THE ENVIRONMENTAL POLLUTION. *(Tomin o kogai kara boei suru keikaku - aramashi). Text in Japanese. 32p., April 1974.*

A new program for environmental protection covering a ten-year period from 1974 was developed based on a previous program. New environmental characteristics, such as the existence of nitrogen oxides, phosphorus, and polychlorinated biphenyls which are difficult to remove, and the possible compounding effect of pollutants which may be harmless individually, were considered for the planning. The environmental standards of major pollutants were revised; sulfur dioxide hourly average for a day under 0.04 ppm and one hour value under 0.1 ppm; nitrogen dioxide, 80% of the total number of days must have an hourly average for the day below 0.02 ppm; particulates, hourly average for a day under 0.01 mg/cu m and 1-hour value under 0.20 mg/cu m; carbon monoxide, hourly average for a day under 10 ppm and for 8 consecutive hours under 20 ppm; non-methane hydrocarbons, hourly average from 6:00 to 9:00 am under 0.35 ppm; lead, daily average under 1.5 micrograms/cu m; odors, insensible. Dates of achievement for the above standards were set between 1975 to 1980, depending on the pollutants. From 1975, factories which consume more than 3 kl/day of heavy oil are required to be equipped with desulfurization apparatuses. Changes of fuel from heavy oil to gas or electricity are also recommended. Traffic regulations are enforced to reduce pollution from automotive exhaust gases.

40094 **APTIC NO. 62486**

Yokohama Municipal Government (Japan), Bureau of Pollution Control

POLLUTION PREVENTION CONTRACTS. (PART II). *(Kogai boshi keiyaku). Text in Japanese. 91p., March 1974.*

The agreements between the Yokohama Municipal Government and various industries along the Tokyo-Yokohama industrial belt are published in 20 documents. The contracts include, depending on the type of individual industry and its specific pollution problems, agreements to install pollutant control equipment such as desulfurization systems, higher stacks, or new boilers; the use of lower sulfur content fuels; emergency countermeasures for use during alerts and warnings, and prevention of additional pollution problems by bad odors, gases from fuel additives, or water pollution by absorbents. The types of industries represented in these contracts are: electric power industries, petroleum refining or production, gas manufacturing, chemical products researches, iron and steelworks, chemical manufacturing, glass manufacturing, oil and fat processing, automobile manufacturing, and chemical engineering. The total rate of reduction of sulfur oxides for 1971 was 42.5%, 50.7% by the end of 1972, and 47.7% by June 1973.

40095 **APTIC NO. 62560**

Quarles, John

ILLINOIS, MICHIGAN, MINNESOTA AND WISCONSIN: PROPOSED REVISIONS TO IMPLEMENTATION PLANS. *Federal Register, 39(78):14221-14225, April 22, 1974.*

Revisions to compliance schedules for implementation of the national ambient air quality standards under the Clean Air Act have been submitted for individual sources in Illinois, Indiana, Michigan, Minnesota, and Wisconsin. These submitted schedules are identified in this notice by source, location, applicable regulation, date schedule adopted, and final compliance date and set forth as proposed rulemaking. Public comment is being solicited as to whether the schedules should be approved.

40096 **APTIC NO. 62891**

Japan Environmental Agency, Tokyo, Air Quality Bureau

AN OUTLINE FOR THE IMPLEMENTATION OF SMOG CHAMBER INVESTIGATIONS OF PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku hanno ni yoru taiki osen sumoggu chanba chosa hisshi yoko). Text in Japanese. 4p., June 1974.*

The Japan Environmental Agency Air Quality Bureau will commission a private pollution control agency to investigate the state of environmental pollution in the Tokyo and Osaka Bay areas using mobile smog chambers with ultraviolet rays for analyses of pollutant transformation and secondary pollutant formation. Two locations each in both bays during summer and one location in the Tokyo Bay are to be designated. The investigation will run from summer 1974 to the early part of 1975. The measurements to be taken are sulfur oxides, carbon monoxide, nitrogen oxides, nitric oxide, nitrogen dioxide, total hydrocarbons, methane, HC compositions, ozone, oxidants, peroxyacetyl nitrate, total aldehydes, formaldehyde, acrolein, and aerosols. The meteorological conditions to be studied are the wind direction and speed, temperature, humidity, ultraviolet ray quantity, visible light quantity, and ultraviolet ray by wavelength. The methods to be used are flame ionization detector, chemiluminescence, the Saltzman method, coulometry, MBTH absorption spectrophotometry, pararosanaline, and other standard methods.

1973

40097 **APTIC NO. 62007**

Bilder, Richard B.

THE ROLE OF UNILATERAL STATE ACTION IN PREVENTING INTERNATIONAL ENVIRONMENTAL INJURY. (FINAL REPORT). *Wisconsin Univ., Madison, Sea Grant College Program, Rept. WIS-SG-73-219, 63p., Sept. 1973. 108 refs.*

NTIS: COM-73-11936

The role of unilateral state action in preventing international environmnetal injury is examined, with air pollution and pesticide problems being cited as examples of problems requiring such unilateral action since only the state directly involved is in a position to deal effectively with these primarily domestic challenges. Topics considered include: types of unilateral state actions; the legality of unilateral action by a state to protect itself from environmental injury; the legality of unilateral action by a state to protect community environmental concerns; the effects of unilateral action; and accomodating individual state action within a multilateral framework.

40098 **APTIC NO. 62609**

Draper, P.

REGULATIONS REGARDING SMOKE EMISSION: ARE THEY ADEQUATE? HOW CAN THEY BE STRENGTHENED? *Preprint, National Society for Clean Air, Brighton (England), 16p., 1973. (Presented at the National Society for Clean Air Spring Seminar, Oxford, England, April 3-4, 1973.)*

Smoke control regulations for diesel engine road vehicles in Great Britain are discussed. In 1967 the British Standards Institution (B.S.I.) Committee prepared a draft specification on the performance of diesel engines for road vehicles. A relatively short section on smoke control may be summarized by stating the maximum allowable smoke from the exhaust of any engine lies on a published curve relating carbon concentration of gm/cu m of exhaust gas to the nominal gas flow in l/sec, or the air throughput of the engine concerned. Thus, all sizes of engine at all practical rpm are covered by this one graph. Despite protests from the N.S.C.A. that the maximum allowable smoke limit was placed at too high a level since all new engines would be able to leave the factory with slight to dark smoke, according to engine size, the allowable smoke limits were maintained. Legislation is coming into effect to make it an offense to market diesel road vehicle engines which make more than a light visible smoke when new, but it is evident that the regulation will have to be tightened to provide that the engines are rated at maximum power outputs providing an acceptable margin below the overload output at which visible smoke occurs.

40099 **APTIC NO. 61036**

Fokina, V. D.

PROTECTION OF THE PURITY OF ATMOSPHERIC AIR IN GREAT BRITAIN. *(Okhrana chistoty atmosfernogo vozdukha v Velikobritanii). Gigiena i Sanit., 38(6):88-89, June 1973. 3 refs. Translated from Russian, 5p.*

The sources, effects, and dispersion of air pollution in Great Britain are generally reviewed. In 1956, the Clean Air Act was passed to limit use of certain types of fuel, provide for monitoring, set up emission limits, and set up operating and equipment standards for sources. Various proposals have been made and laws have been passed to limit pollution from automobiles. Diesel and electric engines are being studied as replacements for spark ignition engines. Since the passage of legislative action in 1956, Great Britain has had a tremendous improvement in visibility and air quality. This has lead to a decrease in smog formation.

40100 **APTIC NO. 62309**

Kennedy, A. S., K. G. Croke, T. E. Baldwin, and R. L. Reisenweber

AIR POLLUTION/LAND USE PLANNING PROJECT VOLUME I. SELECTED LAND USE CONTROL POLICIES FOR AIR QUALITY MANAGEMENT. *Argonne National Lab., Argonne, Ill., Center for Environmental Studies, Office of Air and Water Programs, Interagency Agreement Environmental Protection Agency-IAG-0159(D), Rept. EPA-450/3-74-028-a, 46p., May 1973.*

Alternative means for the control of high emission source clustering were investigated in order to meet and maintain ambient air quality standards called for by the Clean Air Act of 1970, specifically, nondegradation of air quality presently better than the national standards. Three policies were considered: air pollution impact statements; zoning control in two forms, permitted use zoning and emission density limited zoning; and the prediction of air pollution impacts of comprehensive regional land use plans. The source clustering problem in the Chicago area was studied specifically in relation to the effectiveness of the three investigated control strategies. An impact statement policy can be based on the two diget SIC classification. Emission density zoning is an effective long range control and is no more costly than point source control, assuming a stable zoning process. Deterioration in air quality is predictable and controlled virtually by the definition of the density limitation. Comprehensive planning as a control mechanism depends on: the stability of the plan over time; the ability of public administrators to implement the plan; and the ability of planners to forecast the air quality effects of land use decisions and policies and to rank land use. (Author abstract modified)

40101 **APTIC NO. 61788**

Nakano, Michio

THE AIR POLLUTION CONTROL PROGRAM IN THE UNITED STATES. *(Amerika gasshukoku no taiki osen boshi keikaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(10):1005-1010, Oct. 1973. 3 refs.*

Reports on the state of American air pollution programs presented by the Environmental Protection Agency at the International Symposium on Air Pollution in Tokyo, 1972 and the First Pacific Chemical Engineering Congress, 1972 are briefly reviewed. Topics covered included the Federal administration policy on environment, environmental standards set in the Clean Air Act, pollution emission sources, the air quality control region and its control procedures, emission standards for newly built sources, auto emission standards, fines applied to violators, and the costs of pollution control. The U. S. program is designed to carry out its ends in a rather short period. However, recent information indicates that the Nixon administration has taken a negative attitude toward welfare and the environment. Environmental policy is also set back because of the energy crisis.

40102 **APTIC NO. 62403**

Viraraghavan, T.

ENVIRONMENTAL PROTECTION AND THE CONSULTING ENGINEER. *J. Inst. Engrs. (India) (Calcutta), 54(PH1):7-9, Oct. 1973. 4 refs.*

The future trends in environmental protection activities and the role of the consulting engineer in implementing these programs are discussed generally. The method of choosing a consultant and how he can be used with advantage are explained. A consulting engineering firm with facilities for in-house research and multidisciplinary organizational content is best suited to try innovations, and innovation is the key to progress. The opportunities and work load for consulting engineers in the area of environmental protection are enormous. (Author abstract modified)

40103 **APTIC NO. 62188**

Yuill, R. T.

SURVEY OF EPA USER INTEREST FOR PROPOSED STATE IMPLEMENTATION PLAN. AUTOMATED INFORMATION SYSTEM. (FINAL REPORT). *Computer Sciences Corp., Environmental Protection Agency Contract 68-02-1095, Rept. EPA-450/3-73-011, 133p., Nov. 30, 1973.*

NTIS: PB 232125/AS

A survey was undertaken to define Environmental Protection Agency user requirements for a proposed State Implementation Plan (SIP) automated information system. The parts of the SIP which should be computerized, and in what manner, were determined from the user survey. The system should be able to be updated. Survey results are presented in tabular form and are analyzed. A copy of the questionnaire is given. Based upon survey results and a projection of potential users, it is estimated that 20 SIP information system queries per day would be made. Most of these 20 queries would come from people who wish to access rules and regulations in some form. Thus, computerization of rules and regulations should be of the first priority. Since interest was expressed in baseline air quality and emission data, these data should be compiled and published in report form. Since interest was expressed in current information concerning monitoring stations, SAROAD and SIP Semi-Annual Progress Reports should be utilized. Additional capabilities might be required in SAROAD to provide ready access to monitoring station information. Interviewees were interested in current resource information, which is not available in the SIPs but which can be found in Air Pollution Control Program Grant information. Rules and regulations related to new sources and modifications of existing sources were of interest. Regulations that apply to new and modified sources might be accessed. A means of access new sources could also be provided as an additional NEDS capability. Interviewee interest in compliance schedules should be satisfied by the Compliance Data System; no additional SIP computerized capability should be required. Since interest in other areas of the SIPs was comparatively slight, computerization of those areas should not be pursued at this time. (Author summary modified)

40104 **APTIC NO. 61009**

Der Rat von Sachverstaendigen fuer Umweltfragen (West Germany)

AUTOMOBILE AND ENVIRONMENT. *(Auto und Umwelt). Sept. 1973. 90 refs. Translated from German, 171p.*

The interrelationships between the automobile and the environment are described. The present situation, long-range planning of transportation alternatives, recommendations for influencing transportation demand and for direct measures to reduce air, noise, water, and solid pollution, and goals and implementation problems in pollution control are reviewed. The long-range organization of transportation supply requires integrated planning and consideration of urbanization, transportation in rural areas, and regional and urban planning. Direct measures to curb pollution include driving bans, parking restrictions and motor pools. Economics can also be used to reduce pollution. Measures which are both politically feasible and market-conforming include general nonspecific taxes, density-specific taxes, and increasing the attractiveness of public transportation by increasing service, providing special lanes for buses, and using zero fare, park-and-ride, and other incentives to increase ridership. Direct control methods include measures to reduce emissions by legislation, technical changes to the engines, new engines, taxation, emission limits, and traffic planning and regulation. Various German laws, regulations, and standards are listed.

40105 **APTIC NO. 61028**

UNITED NATIONS: ECONOMIC COMMISSION FOR EUROPE. GOVERNMENT CONSULTANTS OF CEE COUNTRIES FOR ENVIRONMENTAL PROBLEMS. WORKING GROUP ON AIR POLLUTION PROBLEMS. NATIONAL MONOGRAPH OF BELGIUM. *(Commission Economique pour l Europe. Conseillers des Gouvernements des Pays de la CEE pour les Problemes Ralatifs a l Environnement. Groupe de Travail des Problemes de la Pollution de l Air). Preprint, 1973. (Presented at the Seminar on Abatement of Pollutant. Emissions from Non-Ferrous Metal Industry, Dubrovnik, Yugoslavia, Nov. 19-24, 1973.) Translated from French, 7p.*

The main gas and particulate pollutants from the production of nonferrous metals (aluminum, copper, zinc, lead, and tin) are sulfur dioxide, sulfur trioxide, chlorine, bromine, fluorine, lead, arsenic, zinc, cadmium, and antimony. Control methods for dust include filters, electrostatic precipitators, and scrubbing. Control method s for stack gases include scrubbing with absorbents, recovery of SO2 by the contact method, and a syphon converter. Studies are underway in Belgium to determine the relative importance of nonferrous metal production as an emission source. All nonferrous metal plants must obtain authorizations to operate to prevent or reduce pollution. The technical official can propose the issuance of the requested authorization if certain conditions are satisfied. Once a person has obtained an authorization, he must inform the technical official at least 15 days in advance of the planned date of operation of the installation. Tests are given to the facility to make sure it meets pollution requirements; if it does not meet requirements, steps can be taken by the government to control the emissions or close the plant.

40106 **APTIC NO. 61753**

CURRENT SCENE: THE BRITISH OCCUPATIONAL HYGIENE SOCIETY COMMENTS ON THE TRAINING AND MANPOWER NEEDS FOR POLLUTION CONTROL. *Ann. Occupational Hyg., 16(4):341-343, Dec. 1973. 4 refs. (Presented at the British Occupational Hygiene Society Spring Conference on Current Awareness in Environmental Hygiene, London, April 1973.)*

A memorandum from the British Occupational Hygiene Society to the Royal Commission on Environmental Pollution concerning the training and manpower needs for pollution control is presented. Occupational hygiene and general environmental control have in common a need for personnel with experience in the two fields of technology and biology. Both are concerned with the assessment of the probable effects of various technological activities on the environment surrounding, or resulting from, these activities and the prediction of the ensuing effect on human, animal, and plant life. The number of persons within a normal industry or government department trained to take an informed and balanced view of both sides is limited. It is difficult to estimate the extent of the need for personnel in the hygiene and environmental control field. In a 1955 survey, it was reported that about 15% of a sample of factories visited were found to be in need of monitoring and control of toxic hazards; no account was taken of other environmental hazards. It was calculated that such findings showed a need for some 500 hygienists. There are two levels of qualification: a lower level relevant to personnel concerned with the detailed measurement of environmental factors and a senior level those for those having the professional responsibility of interpreting the findings of environmental investigations and for the design and implementation of control programs.

40107 **APTIC NO. 61912**

Tokyo Metropolitan Government (Japan), Pollution Control Bureau

A SUMMARY OF AIR POLLUTION EMERGENCY MEASURES ENFORCEMENT PLANS FOR METROPOLITAN TOKYO. (SULFUR OXIDES). *(Tokyoto taiki osen kinkyuji taisaku jisshi yoko. (Iosankabutsu)). Text in Japanese. Dec. 1973. 50p.*

Watches for air polution are issued in Tokyo when sulfur dixoide concentrations at at least two standard monitoring stations are higher than 0.2 ppm for 3 consecutive hours; higher than 0.3 ppm for 2 consecutive hours; the 48-hour average is higher than 0.15 ppm; or when the SO2 concentration at one station is than 0.5 ppm. Warnings of air pollution are issued when the concentration exceeds 0.5 ppm during the watch period or when it exceeds 0.5 ppm for 2 consecutive hours. Air pollution alerts are issued when the concentration at one station exceeds 0.5 ppm for 3 consecutive hours or 0.7 ppm for 2 consecutive hours. Public cooperation is requested at these special occasions. Factories are requested to reduce about 30% of their total SO2 emission when an air pollution watch is issued but at least 70% of the total SO2 emission when a warning or alert is issued.

40108 **APTIC NO. 62046**

Council on the Environment of New York City, New York

CITIZENS POLICY GUIDE TO ENVIRONMENTAL PRIORITIES FOR NEW YORK CITY 1974-1984. (INTERIM REPORT). *66p., Dec. 1973.*

A preliminary report on a study of priority decisions that must be made by citizens and leaders in New York City regarding environmental dangers that was conducted by the Council on the Environment of New York City is presented. Task forces were set up to study energy resources and environmental quality, transportation, recovery and disposal of wastes, pollutants, noise, environmental education, enforcement and dispute settlement, and townscape. The automobile has a multitude of environmentally destructive impacts. The transportation of people and goods accounts for roughly 95% of the carbon monoxide emissions, 65% of the hydrocarbons, 40% of the nitrogen oxides, and 15% of the particulates in the city air, as well as significant doses of toxic heavy metals. To set standards for pollutants, firm information is needed as to source and current level of exposure and the impact on public health of the pollutant at various exposure levels. However, the health effects of current levels of a number of pollutants are unknown at this time, resulting in standards that are often unavoidably set on the basis of arbitrary judgments. Errors in judgment are also due to the fact that competent scientists can vary significantly in their honest recommendations.

40109 **APTIC NO. 62048**

International Engineering Service Consortium, Propietary Ltd., Sydney (Australia)

FEASIBILITY STUDY FOR AN AUTOMATIC POLLUTION MONITORING NETWORK FOR AIR, WATER AND NOISE IN THE SYDNEY REGIONAL AREA. (THE FIRST MODULE OF A NATIONAL NETWORK). *Nov. 1973. 170 refs.*

The air, water, and noise quality in Sydney are reviewed, and predictions are made of future trends. A continuous monitoring network will be needed in the area. The network should use land-line telemetry. Wind and other meteorological parameters should be measured in addition to air and water quality. All measurements will be correlated by a control center which would combine the important administrative, operational, and maintenance responsibilities for the network. Data would be analyzed by computer. The total estimated capital cost would be $2,122,000 with an annual operating cost of approximately $944,700. Future extension of the system could raise these figures to $3,122,000 and $1,100,000, respectively. About $300,000/yr has been recommended for an extensive research program.

40110 **APTIC NO. 62069**

Department of Commerce, Washington, D. C., National Oceanic and Atmospheric Administration

AIR POLLUTION CONTROL METEOROLOGICAL SERVICE. *In: The Federal Plan for Meteorological Services and Supporting Researh. p. 22-23, June 1973.*

The activities and objectives of the Air Pollution Control Meteorological Service are described. The service provides essential meteorological data on forecasting to Federal, State, and local governmental agencies responsible for dealing with urban air pollution and advises the public of weather conditions that may lead to serious air pollution episodes. The objectives of the service are to establish and maintain weather support to those urban regions where the threat of critical air pollution episodes still exists and to increase the utility of air pollution weather forecasts by improving their timeliness, lead time, and accuracy. The threat of air pollution episodes in some urban areas has diminished so that special support is no longer required at the previous level of effort.

40111 **APTIC NO. 62104**

HEALTH CODE OF THE UNITED STATES OF MEXICO. *(Codigo Sanitario de los Estados Unidos Mexicanos). Text in Spanish. Salud Publico Mexico, 15(2):173-221, March-April 1973.*

The new Mexican health code of 1973 contains 508 separate articles which include the authority granted to the national health service (articles 1-4), the responsibility of sanitary organizations (5-10), coordination and cooperation among health services (12-20), the delegates of the Health Secretariate (21-24), actions to be taken during disasters and epidemics (25-29), promotion and improvement of health services (30-32), education (33-37), nutrition (38-42), mental health (43), environmental sanitation (44-46), the air (47-49), the soil (50-2), water (53-9), territorial waters (60-5), radiation protection (66-72), health services in towns (73-8), rules for building construction (79-85), streets, communication, and transport (186-88), cadavers (89-100), work hygiene (101-07), accident prevention (108-11), communicable diseases (112-40), noncommunicable diseases (141-48), accidents (149-50), rehabilitation (151-58), disciplines and presentation of health services (159-65), technical and auxiliary activities (166-68), health research (187-95), food and beverage- both alcoholic and non-alcoholic-control (212-48), tobacco control (249-52), medicine control (253-76), medical equipment control (277-82), cosmetics and beauty aides (283-89), drug control (290- 318), psychotropic drug control (319-29), pesticide control (330-37), international health responsibilities (338-54), immigration control (355-63), health on land, sea, and air transport (364-81), statistics (382-87), authorizations and registries (388-403), inspections (404-21), security measures (422-38), administrative sanctions (439-64), procedures to apply administrative sanctions (465-72), crimes (493-508).

40112 **APTIC NO. 62111**

Japan Chamber of Commerce and Industry

BUSINESS REPORT OF INDUSTRIAL POLLUTION CONSULTING ROOM. *(Sangyo kogai sodanshitsu jigyo hokoku). Text in Japanese. 34p., Nov. 1973.*

Advisory services of the Japan Chamber of Commerce and Industry Industrial Pollution Consulting Room include consultations in the office, consultations at the emission source, short courses, lectures, and a training course for advisory staff. In 1973 there were 821 office consultations, 119 source consultations (28 related to air pollution), 21 social gatherings, and 40 educational meetings. Representative examples of consultations are given.

40113 **APTIC NO. 62211**

Michigan State Bureau of Programs and Budget, Lansing, Office of Planning Coordination

ENVIRONMENTAL QUALITY IN MICHIGAN - 1970. (FINAL REPORT). *Housing and Urban Development Proj. Michigan P-301, Ser. TR D2a, 185p., Jan. 1973.*

NTIS: PB 201124

On Jan. 22, 1970, Michigan's Governor outlined a comprehensive environmental control program. Mercury contamination in the waters along the eastern side of Michigan caused the Governor to take unprecedented action, shutting down an industry until its Hg discharges had been eliminated, and placing a ban on fishing in the affected waters. The situation prompted the introduction of the Governor's unique truth-in-pollution program. Other legislative initiatives were taken in the areas of citizen environmental protection suits, Great Lakes Shorelands, wild and scenic rivers, and watercraft pollution. The Advisory Countil for Environmental Quality set policy guides for thermal, noise, air, and water pollution, solid waste management, land use, environmental education, population, environmental health, and the organization of state environmental functions. The Office of Planning Coordination aided the Council in its work and provided policy planning and program implementation assistance to the Governor's Policies and Programs staff. The state of the various environmental areas mentioned above in Michigan are reviewed, and Council for Environmental Quality recommendations are given. An air pollution report is presented which describes control program activities, recommended actions, interrelated agencies, and interrelated environmental considerations with regard to emissions from motor vehicles, prohibition of open burning, disposal of junk cars, disposal of smelting plant tailings, interstate air pollution problems, shortage of fossil fuels, tax exemption for air pollution, agricultural economic losses attributable to air pollution, and loans to industry for the installation of air pollution control equipment. Water management problems and recommendations, abandonment of vehicles, and the organization of the Michigan state government environmental functions are also reviewed.

40114 **APTIC NO. 62216**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

DIRECTORY OF AIR QUALITY MONITORING SITES 1972. *Rept. EPA-450/2-73-006, 797p., Sept. 1973.*

NTIS: PB-231 003/AS

A directory of air quality monitoring sites within the United States and its territories for 1972 is presented. A listing is included of all monitoring sites which have submitted a SAROAD (Storage and Retrieval of Aerometric Data) Site Identification Form. A unique 12 digit SAROAD site code is used to characterize site information. The first two digits identify the state code, the next four identify the city, county, parish, or air pollution control district within the state, the following three identify the particular sampling site within the city or county, and the next letter and two digits identify the type of agency responsible for the sample analysis.

40115 **APTIC NO. 62347**

Dept. of Transportation, Washington, D. C., Federal Highway Administration

DRAFT ENVIRONMENTAL IMPACT STATEMENT PURSUANT TO SECTION 4332 (2)(C), TITLE 42 U. S. C. AIR QUALITY GUIDELINES FOR IMPLEMENTING SECTION 109(J), TITLE 23 U.S.C. *26p., Aug. 1973.*

NTIS: EIS-AA-73-1428-D

A draft environmental statement on air quality guidelines for implementing section 109(j), Title 23 U.S.C. is presented. The procedures and requirements of the proposed guidelines consist of systems planning considerations, project level considerations, and construction/air quality considerations. The draft guidelines attempt to outline a process to assure consistency with State Implementation Plans and National Ambient Air Quality Standards. The draft guidelines do not attempt to define either the air quality analysis techniques to be followed or the levels of analysis to be applied to various types of projects. Each State has unique meteorological conditions and topographical features which would influence the dispersion of air pollutants and thereby influence levels of analysis. The levels are not specified for nationwide application to allow flexibility to encourage the development of technical tools and to give state highway agencies an opportunity to gain facility in analyzing the air quality impact of highway proposals.

40116 **APTIC NO. 62505**

Yokohama Municipal Government (Japan), Bureau of Pollution Control

REPORT ON INVESTIGATIONS OF POLLUTION IN YOKOHAMA. *(Yokohama-shi taiki osen chosa hokokusho). Text in Japanese. Rept. 13, 92p., 1973.*

The city of Yokohama has a regular monitoring program for settling particles at 16 locations by deposit gauge to supplement the automatic monitoring system at 8 locations and by lead dioxide at 32 locations. The SOx, suspended particulates, and wind velocity and direction are automatically and continuously monitored at 8 locations in the city and the data are processed and analyzed at the central controlling board after it is sent by telemeter. Continuous monitoring of automotive emissions is conducted also at 8 locations, and the CO level, nitrogen oxides, oxidants, suspended particulates, hydrocarbons, and traffic quantity are measured and analyzed. In addition, oxidant levels are checked at five schools every hour. Heavy metal components in suspended particulates are taken by the light scattering method and weight method at 7 locations, two or three times a year, over the period of 1 week each time. Mobile monitoring with automatic emission gas measurement apparatus is conducted about 20 times a year. Dependable professional organizations are commissioned to conduct special investigations. Recently, automotive emission gas distribution patterns were investigated by the Yokohama Pharmaceutical Assoc. at 80 locations in the city. Photochemical smog meteorological studies were conducted by the Japan Meteorological Assoc. Every summer and winter for 1 month each, a special council conducts an investigation of large area pollution patterns. Special environmental studies are made from time to time for regulatory control of factories.

1972

40117 **APTIC NO. 58257**

Bach, Wilfrid and Anders Daniels

BASIC CONCEPT OF AIR QUALITY CONTROL. A GUIDE TO AIR RESOURCES MANAGEMENT FOR USE BY GOVERNMENTAL AND PRIVATE AGENCIES. *Hawaii Univ., Honolulu, National Science Foundation Atmospheric Sciences Section Grant GA-23660, 35p., April 1972. 32 refs. (Presented at the United Nations Conference on the Human Environment, Stockholm, Sweden, June 5-16, 1972.)*

Since Hawaii has been experiencing the degradation of its environment for a number of years it is well suited to serve as a model for other nations so that similar aftermaths of uncontrolled growth can be avoided. The basic diffusion models presently in use are discussed. The Honolulu Diffusion Models for stationary point sources and area sources are presented as refinements of commonly used models. Since most ambient air quality standards are based on the frequency of occurrences of maximum pollutant levels, the models can be modified to accommodate these specific requirements. A cost-benefit analysis is presented that can determine the best control strategies, and thus the maximum net benefits from air quality control at optimum economic and social costs. Comprehensive air quality control requires such a system of models which, through constant feedback, can allow for any new control situation. Further requirements of an enforceable air quality control program, such as adequate funding and manpower, standardized, accurate, and reproducible methods of sampling and analysis, and an adequate surveillance network, are discussed. A validated diffusion model would permit a reduced monitoring network, which could result in large cost savings. (Author abstract)

40118 **APTIC NO. 62304**

Bellomo, Salvatore J.

A PROGRAM FOR CONSIDERING AIR QUALITY IN URBAN PLANNING AND TRANSPORTATION: A SUMMARY. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 155-193. 165 refs.*

Research was conducted to determine and demonstrate the air pollution aspects of urban planning and transportation and to encourage the inclusion of air quality considerations in the decision making process. The failure of planners and decision makers to consider air quality effects may be due to lack of precise information on urban planning and air pollution relationships and to the absence of a methodology to incorporate air pollution considerations into the planning process. This research program was intended to solve these problems. The need for such a program, the program structure, and illustrations of the types of results that are likely to emerge from the program are described. The different projects in the research program include adapt basic research, case studies, simulation studies, demonstration projects, legal and administrative studies, and information dissemination and training. Some examples are given.

40119 **APTIC NO. 62299**

Brail, Richard K.

MODELING THE INTERFACE BETWEEN LAND USE, TRANSPORTATION, AND AIR POLLUTION. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 41-61. 42 refs.*

General issues involved in developing a set of computer simulation models which can forecast air pollution concentrations on a regional level are discussed. The land use and transporation components of urban structure which affect air quality are described. Computer simulation modeling can be used to evaluate the ramifications of environmental programs and to choose optimal transportation and land use configurations which will satisfy environmental quality objectives while minimizing disruptive effects on socio-economics. The understanding of complex nondeterministic systems requires orderly and coherent information handling procedures such as the simulator.

40120 **APTIC NO. 62305**

Croke, Edward J., Kevin G. Croke, and Allen S. Kennedy

THE IMPACT OF URBAN GROWTH AND DEVELOPMENT ON THE ACHIEVEMENT OF AIR QUALITY STANDARDS. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 206-236. 6 refs.*

The structure, development, and testing of a pilot version of an air resource management plan evaluation system based on land use and designed to provide an interface between conventional air pollution control and regional planning are described. The system can be used to evaluate the long-term potential for obsolescence of conventional control regulations, to assess the air pollution potential of proposed land use or zoning plans, to project urban or regional growth and air quality, to design and evaluate land use-based air pollution control strategies, to design administrative and institutional mechanisms for implementation of locational control policies, and to define communication interfaces between regional and transportation planners and environmental protection programs. The structure of the planning problem, the development of a land use-based emission inventory, the estimation of land use emission factors based on zoning, predictions of emissions based on a growth in place approach and on economic activity-related emission factors, land use-based analysis of regional air quality, projections using economic growth factors, the development of land use-based air pollution control policies, and administrative mechanisms of locational air pollution control policies are described.

40121 **APTIC NO. 62307**

Cross, Frank L., Jr.

ENVIRONMENTAL CONSIDERATIONS IN LOCATING LARGE POINT SOURCES ON ENVIRONMENTAL POLLUTION. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 251-265. 5 refs.*

In order to develop a status report on large point sources, a questionnaire was developed concerning the problem areas considered significant in relating environmental features to industrial site selections. The questionnaire was then sent to 50 organizations known to have recent experience with such problems. In the questionnaire, 24 site selection factors were ranked in order of importance, problems in obtaining approval from the government and the public to locate a new plant were listed, various environmental problems were ranked in order of importance, the importance of air and water pollution control to site selection was described, and ways of solving problems were reviewed. Responses to the questionnaire and information needed for site selection are discussed. Site selection must consider the area and quality of emissions, emission controls, impact on the environment, and compliance with regulations.

40122 **APTIC NO. 62319**

Edwards, H. W.

COLORADO STATE UNIVERSITY RESEARCH PROGRAM. *In: Impact on Man of Environmental Contamination Caused by Lead. Interim Report. July 1, 1971 to June 30, 1972. Colorado State Univ., Fort Collins, National Science Foundation Grant IRRPOS GI-4, RANN GI-34813X, p. 9-45, 1972. 90 refs.*

NTIS: PB 223623

Major occurrences which have increased the need for information on the effects of lead on health and for a decision on lead additives in gasoline are: the requirements of the Clean Air Amendments of 1970 to reduce the lead content of gasoline; the National Research Council-National Academy of Sciences report on the biological effects of lead; the Environmental Protection Agency s position on the health hazards of airborne lead which recommends air lead concentrations below 2 micrograms/cu m; proposed rule-making to reduce lead in fuel additives to less than 2.0 g/gal in Jan. 1975, 1.7 g/gal in Jan. 1976, 1.5 g/gal in 1977, and 1.25 g/gal in Jan. 1978; the study by the National Academy Science on the feasibility of meeting automotive exhaust gases which states that 1975 and 1976 standards cannot be met with current technology; the report of the Ad Hoc Committee on the Cumulative Regulatory Effects on the Cost of Automobile Transportation (RECAT) which describes the increased fuel costs and increased fuel consumption of lead additive removal; the results of the International Symposium on Environmental Health Aspects of Lead in Amsterdam, Oct. 2-6; the Seven City Lead Study; and other evidence of the effects of lead on health. A study was instituted at Colorado State University to determine how, where, in what forms, and what rate is automotive lead accumulating in the atmosphere. The research plan, interdisciplinary approach, program management, and project meetings of this study are reviewed. Efforts to identify and to communicate with information user groups and interactions with information user groups are described. These interactions include the Three-University Lead Study, an International Symposium on Environmental Health Aspects of Lead in Amsterdam, supplying of results to EPA, the Three- University Conference on the Atmospheric Component of Lead Pollution, meetings with Colorado State officials, local contacts, and the preparation and publication of various papers and reports.

40123 **APTIC NO. 62302**

Fensterstock, Jack C., Brian T. Ketcham, and Michael P. Walsh

PROBLEMS ASSOCIATED WITH AIR QUALITY CONTROL REGION IMPLEMENTATION PLANS. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 105-114.*

The Air Quality Control Region Implementation Plan for New York City for nitrogen oxides, nonmethane hydrocarbons, carbon monoxide, and oxidants is described. It was conceived and designed by the Department of Air Resources of the New York City environmental Protection Agency to meet requirements of the Clean Air Act. Major aspects of the plan are reviewed, and the problem of actually carrying out the plan is discussed. Source standards for the pollutants, existing air quality (1970), motor vehicle emissions in Manhattan in 1970, and control strategies are reviewed. The plan requires commitment by local, state, regional, and Federal authorities and by commercial interests. Unfortunately, this basic concept has been neglected in the Federal guidelines dealing with implementation plans, and, therefore, the actual achievement of air quality standards is speculative. Hopefully, the necessary cooperation will be forthcoming and the standards achieved. (Author summary modified)

40124 **APTIC NO. 61975**

Hoch, Irving

URBAN SCALE AND ENVIRONMENTAL QUALITY. *In: Population Resources, and The Environment. Vol. 3. Resources for the Future Inc., Commission on Population Growth and the American Future, p. 232- 284, 1972 (?). 149 refs.*

Generally, large urban areas have degradation of environmental quality; the larger the area, the lower the quality. Persons living in urban areas are often unsatisfied with their life and say they would prefer rural areas or small towns. However, a tradeoff has occurred because people in the urban areas are receiving more income than people in small towns. If improvements to the environment occur in the urban area, more people will migrate into the area because the area is more attractive until an equilibrium is again attained. This hypothesis is documented with sections on population and income, environmental quality, and policy issues. Urban environmental quality considered includes air quality. climate, water quality, solid waste disposal, noise, and the social environment. Policy issues discussed include limiting city size, implications of compensatory payments, impact of air and water quality legislation institutional aspects of solid waste disposal and noise problems, new towns and the environment, and tolls. Tables are given showing the estimated emissions of air pollutants in the U. S. in 1969, selected particulate constituents as percentages of gross suspended particulates in urban and nonurban areas, distribution of annual mean levels of pollutants (suspended particulates, sulfur dioxide, and nitrogen dioxide) by city size in 1968, values for pollutant concentrations versus population class, regression results for mean pollutant levels related to set of explanatory variables, air quality data for New York City, long term suspended particulate trends, air pollution exposure indexes by housing tenure and race, and climatic changes produced by cities.

40125 **APTIC NO. 62298**

Krueckeberg, Donald A.

STATE ENVIRONMENTAL PLANNING: A PROBLEM OF REQUIREMENTS VS. BEHAVIOR. *In: Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 29-38. 5 refs.*

The Federal requirements and expectations of the state role in land use and transportation planning with respect to pollution are discussed. To establish more and better connections between planning for land use and transportation and planning for pollution control in the states will not be a simple or easy task. Requirements of this kind will meet with strong resistance and opposition because of inertia, habit, or momentum of past positions or activities. The legislative requirement, by itself, will be a totally ineffective incentive. Research that purports to illuminate the behavior of states on environmental issues, but has as its only data the mandates of state legislatures, must be viewed as partial and largely misleading. A greater understanding of management in practice and the ways in which organizations actively behave is necessary. National policy, in order to be effective, must deal with the fact that the desired ends and goals it sets will be distinctly different from those that have held priority in the past and that changing of behavior is going to require a great deal of effort beyond the legislatures. The odts are against success.

40126 **APTIC NO. 62303**

Kurtzweg, Jerry

AIR POLLUTION CONSIDERATIONS IN AIRPORT PLANNING. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 137-151. 10 refs.*

Federal legislation requires that air pollution be considered when airports are built. Relevant legislation requiring inclusion of airport planning is discussed. An analytical framework for helping to evaluate the air pollution impact of all or part of an airport system is presented. Ways to integrate air pollution consideration into airport planning are proposed. Both aircraft and nonaircraft emission sources must be included in analyses of air transportation effects on air pollution. The multiplier effect of the airport in terms of attracting development in the airport area should also be evaluated. An Air Transportaion Impact Model is proposed to evaluate actions which might affect air quality. Although the model is designed to rely to a large extent on existing data and methods, some significant gap areas do exist which must be dealt with before the model can become fully operational for all pollutants. The most important of these areas include models for estimating dispersion and transport of emissions, particularly during landing and takeoff, and chemical reactions of pollutants forming photochemical smog. Additional measurements of both piston and gas turbine aircraft emissions should be made to assure representative values for use in emission estimation. Increased monitoring of air quality is necessary for dispersion model validation. Studies to fill the gap areas are currently under way. Sufficient data and methods are currently available to begin development of first generation models. (Author summary modified)

40127 **APTIC NO. 62712**

Murphy, E. F.

LAW AND TRACE METALS. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center; National Science Foundation; and Battelle Memorial Inst., Columbus Labs., Cycling Control Met., Proc. Environ. Resour. Conf., Columbus, Ohio, 1972, p. 179-187. 60 refs. (Oct. 31-Nov. 2.)*

The legal problems of trace metals are generally reviewed. Lead, mercury, copper, zinc, beryllium, chromium, iron, cadmium, vanadium, nickel, and asbestos are considered. The sources and laws affecting these pollutants are discussed. Workmen s compensation, industrial hygiene, and environmental protection laws are considered.

40128 **APTIC NO. 61606**

Renard, B.

FOR A BETTER ENVIRONMENT IN FRANCE, I. *Fr.-Am. Commer., 1972:15- 18, 44, March-April 1972.*

The four point program of the French government to improve the environment in France is discussed. The program consists of regulations, information, research, and concrete action. The main provisions of the program relate to the fight against pollution generally, and the protection and improvement the rural and urban environment. Other provisions are expected to combat water, air, solid waste, and noise pollution. The fight against atmospheric pollution was marked by the creation of new protection areas as well as by the adoption of new measures. The regulation for industrial stacks should assure a better dispersion of plant smoke. Provisions have been adopted to limit emissions from household heating plants in the large urban areas and in certain industrial centers. French industry represents a source of pollution equal to that caused by a population of 75 million inhabitants. In the United States it is estimated that industrial pollution is four times greater than urban pollution. (Part II processed as APTIC 61607.)

40129 **APTIC NO. 61973**

Ridker, Ronald G.

RESOURCE AND ENVIRONMENTAL CONSEQUENCES OF POPULATION GROWTH IN THD UNITED STATES. A SUMMARY. *In: Population Resources, and The Environment. Vol. 3. Resources for the Future Inc., Commission on Population Growth and the American Future, p. 17-33, 1972 (?). 3 refs.*

The resource and environmental consequences of population growth in the U. S. are reviewed. The economy, minerals and fuels adequacy, pollution, congestion and outdoor recreation, water, agriculture, urban environmental problems, and other environmental and social concerns are discussed. Various choices are possible. Reduction in population growth would lead to a stable population within 50 to 75 years, purchase time and resources, and provide for additional freedom of choice in economic decisions. A reduction in economic growth would reduce resource consumption and pollution emissions by more than would comparable reduction in population growth.

40130 **APTIC NO. 62308**

Salzenstein, Marvin A.

INDUSTRIAL PERFORMANCE STANDARDS AS A TOOL IN AIR QUALITY MANAGEMENT. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 266-281. 2 refs.*

Performance standards are used in industrial zoning to translate the classical light, medium, and heavy industrial classifications into well-defined meaningful terms dealing with environmental effects. Purposes and concepts of zoning are reviewed. Examples of air pollution zoning performance standards are discussed including smoke, steam and humidity, particulate matter, sulfur oxide, toxic matter, and odor standards for the Los Angeles County Air Pollution Control District and the Hackensack Meadowlands. Federal activity in the area of performance standards is also reviewed.

40131 **APTIC NO. 62082**

Solomon, Lee H. and Harry F. Mason

ALTERNATE PROPOSALS FOR THE REGULATION OF LEAD ADDITIVES IN GASOLINE. *Turner, Mason, and Solomon, Consulting Engineers, Environmental Protection Agency Contract 68-01-0433, 27p., June 23, 1972. 8 refs.*

Alternate proposals to the Environmental Protection Agency s proposed regulations for fuels and fuel additives are compared. The EPA approach specifies a maximum lead content for all grades of leaded gasoline of 2.0 g/gal on Jan. 1, 1974, gradually decreasing to a maximum of 1.25 g/gal by Jan. 1, 1977. Individual companies and industry trade associations proposed three alternate plans. The first was grade averaging in which the average Pb usage in individual grades over a quarterly period would be controlled at the maximum EPA limits. The second proposed that the average Pb usage in all leaded gasoline shipments over a quarterly period would be controlled at the maximum limits specified by EPA. The Pb content of individual grades of leaded gasoline would not be restricted. The final proposal called for total pool averaging in which the average Pb usage in all gasoline shipments over a quarterly period would be controlled. The impact of each of the alternate regulatory approaches is analyzed based on the assumption that all petroleum industry refiners and marketers respond in an identical optimized manner to the constraints imposed by alternate regulatory approaches. The actual marketing response on the part of the petroleum and automotive industry is assumed to suggest the probable effects of the alternate regulatory schemes.

40132 **APTIC NO. 62306**

Yunghans, Roland S., Edward B. Feinberg, and Byron H. Willis

AIR RESOURCE AND LAND USE PLANNING: THE NEW JERSEY APPROACH. *In: The Relationship of Land Use and Transportation Planning to Air Quality Management. George Hagevik (ed.), New Brunswick, N. J., Rutgers Univ. Center for Urban Policy Research and Conferences Dept., May 1972, p. 237-250. 15 refs.*

Air resource and land use planning in New Jersey is reviewed. The Hackensack Meadowlands plan to reclaim and develop the area, while improving environmental quality, is described. The Hackensack Meadowlands Reclamation and Development Act was passed in 1968. Land use plans have been prepared. An Air Quality for Urban and Industrial Planning (AQUIP) System was developed to study the impact of such land use plans. This computer- oriented system is described and discussed. The system includes a method for computing emissions based on planning data inputs; methods for evaluating air pollution impact associated with a given land use plan based on air quality criteria, and a model for computing air quality based on emissions and meteorological data. The methodology for plan evaluation, methodology for considering compliance with air quality standards, plan evaluation and ranking of other alternatives, plan modification, and other uses of AQUIP are discussed. The AQUIP will be used to evaluate land use plans for the Hackensack Meadowlands.

40133 **APTIC NO. 61688**

Organisation for Economic Co-operation and Development, Air Management Research Group

GENERAL REVIEW OF PROBLEMS RELATED TO THE FORMULATION AND IMPLEMENTATION OF POLICIES FOR THE CONTROL OF AIR POLLUTION IN MEMBER COUNTRIES. *In: Air Management Problems and Related Technical Studies. p. 15-32, 89-93, 1972. 55 refs.*

The development of an air management policy at the international level is discussed and a priority of specific problems or issues is recommended. The policy should not depend on purely technological solutions for abatement. There must be joint policy discussions both of an economic and technical character with authorities responsible for the many different aspects of economic growth and social development. A joint policy examination is required between industrial, agricultural, energy, land use, financial, and legal planners. Rapid progress is possible only through international cooperation. Specific problems or issues where there is greatest need for information in the formulation of policies for air management include: motor vehicle pollution; consequences of continuing increase in demand for energy; the industrial emissions such as fluorides, odors, and particulates; long range mass transport of pollutants; determining single source and multi-source areas; development of continuous monitoring instruments; and research programs on the effects of air pollution. (Author conclusions modified)

40134 **APTIC NO. 61689**

Organisation for Economic Co-operation and Development, Air Management Research Group

AIR MANAGEMENT RESEARCH GROUP: TERMS OF REFERENCE AGREED BY THE COMMITTEE FOR RESEARCH CO-OPERATION AT ITS 6TH SESSION, 10TH AND 11TH JUNE, 1968. *In: Air Management Problems and Related Technical Studies. p. 33-34, 89-93, 1972. 60 refs.*

Problems that are to be considered by the Air Management Research Group of the Organisation for Economic Co-operation and Development are outlined. Of particular interest are urban and industrial pollution; protection of adjacent lands; organization and structure of cities; fuel policy; transportation policy; industrial location; research to improve emission control; and modern agricultural practices. The areas of scientific research that will be evaluated include: measurement of atmospheric pollution; development of automatic and continuous systems of measurement and monitoring; relationship between emissions and ambient pollutant levels; various air pollution effects; and effective restoration and maintenance of air quality.

40135 **APTIC NO. 61691**

Organisation for Economic Co-operation and Development, Air Management Research Group

FACTORS INFLUENCING RESEARCH POLICY IN MEASUREMENT TECHNOLOGY. *In: Air Management Problems and Related Technical Studies. p. 43-52, 93-95, 1972. 41 refs.*

Factors influencing research policy in air pollution abatement are discussed. There is a growing demand for more specificity including the tracing of major emission sources and correlation of pollution with wind direction. The trend is now towards continuous monitoring using automated methods. Priorities in measurement research center on general measurement capabilities; general categories of pollutants; particulates, fuel additives, hydrocarbons, organic compounds, pesticides, and odors; and specific problems associated with certain compounds or groups of compounds: asbestos, carbon monoxide, fluorides, heavy metals, nitrogen oxides, oxidants, and sulfur compounds. A monitoring system will work only if there is a structured concept of dispersion of pollution existing within modeling capability. The major needs for air pollution prediction models include: planning, control strategy, warning, sampling station location and monitoring network design, and review of air pollutant standards which have been set.

40136 **APTIC NO. 61704**

Organisation for Economic Co-operation and Development, Air Management Research Group

PROGRESS REPORT ON THE WORK OF THE POLICY PANEL ON EFFECTS OF AIR POLLUTION. *In: Air Management Problems and Related Technical Studies. p. 149-159, 1972.*

The results of a policy panel on the effects of air pollution are described. The administrative need for policies on health, economic, amenity, and global biological and physical effects of air pollution is generally reviewed. The value and objectives for collaboration in research, the areas for collaboration, an example of a possible co-operative study, and the future direction of collaboration are discussed. National priorities with regard to different pollutants are listed for countries in the Organisation for Economic Co-operation and Development. Countries from which collaborative groups could be formed are listed with respect to their mutual interests for specific pollutants. Areas of research, suggested research needs with respect to specific pollutants, and resources for research on the effects of air pollution are reviewed.

40137 **APTIC NO. 61705**

Organisation for Economic Co-operation and Development, Air Management Research Group

REPORT OF THE POLICY PANEL ON ABATEMENT TECHNOLOGY. *In: Air Management Problems and Related Technical Studies. p. 163-172, 1972.*

The results of a panel on abatement technology are reviewed. The general situation and abatement problems are reviewed in the area of fuel combustion, the emission of fluorides from primary aluminum smelting and production of phosphate fertilizer, abatement techniques for particulates and odors, and emissions from motor vehicles. Results are presented of a questionnaire listing specific abatement problems, interest in these problems, work in progress, and further research in the countries of the Organisation for Economic Co-operation and Development.

1963

40138 **APTIC NO. 62673**

Pady, S. M. and P. H. Gregory

NUMBERS AND VIABILITY OF AIRBORNE HYPHAL FRAGMENTS IN ENGLAND. *Trans. Brit. Mycol. Soc., 46(4):609-613, 1963. 9 refs.*

Numbers and viability of airborne hyphal fungus fragments were studied during July and August 1960, using silicone-coated and glycerine-oated slides in a cascade impactor. Hour-long samples were taken daily between 2 and 4 pm at approximately 1 m above the ground. Hyphal fragments were caught every day, but in very different numbers; concentrations averaged 126/cu m (range 10-599/cu m). The hyphal pieces were mostly 20-40 micron long, but some were shorter than 10 micron and some longer than 100 micron. Dematiaceous fragments were more numerous than hyline ones. Conidiophores, especially the terminal portion, were abundant. Fragments gave rise to a germ tube from one or both ends of the hypha. Frequently the germ tube developed into a short conidiophore which often produced spores. Percentage germination was 1-43 on silicone slides (average 16.2). Germination of Cladosporium spores on the same slides was 16-90%(average 62%). On glycerine jelly, germination was irregular, with hyphae averaging 8.6 and Cladosporium spores 46%. (Author abstract)

SOCIAL ASPECTS

1973

40139 **APTIC NO. 61841**

Katsuya, Atsuo

STUDY ON TOTAL ASSESSMENT OF ENVIRONMENTAL POLLUTION BASED ON AWARENESS OF INHABITANTS TAKEN AS AN INDEX. *(Jumin ishiki o shihyo to shita kankyo osen no sogo kyoka ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, p. 50-54, 1973. 5 refs. (Presented at the Japan Society of Civil Engineers Environmental Problems, Symposium, 1st, Tokyo, Japan, Dec. 3-4, 1973.)*

A questionnaire surveying inhabitant awareness of pollution was distributed among the school districts of Osaka. Questions concerning noise, doors, cleanliness of the river, soiling of laundry, traffic quantity, metal corrosion, stack gases from neighboring factories, plant damage, and health effects were asked. Of the 10,733 questionnaires delivered, 8996 were returned, and the survey results were broken down and averaged for each school district. The square multi-correlation coefficient method was applied to the correlation coefficient matrix obtained from these averages. Both of these values were further extrapolated by the main factor method and the vari-matrix method. The final data were compared with actual air quality measurements to determine correlation. All items showed a high degree of correlation, except those involving the river, and it was postulated that inhabitants were more affected by its appearance than the actual state of contamination.

40140 **APTIC NO. 62311**

Kromm, David E., Ferenc Probald, and Geoffrey Wall

AN INTERNATIONAL COMPARISON OF RESPONSE TO AIR POLLUTION. *J. Environ. Manage., vol. 1:363-375, 1973. 8 refs.*

Questionnaire surveys were administered to 120 residents of Budapest, Hungary and Sheffield, England and 160 residents of Ljubljana, Yugoslavia regarding their attitudes towards air pollution. All three cities have continuous monitoring stations which record the 24 hr concentrations of smoke and sulfur dioxide. Methods of computing smoke values differ but SO2 readings are comparable. The existence of many measuring points in each city reduces the severity of reliability problems influenced by the siting of instruments. Budapest experiences the most pollution, though concentrations are high in each city during thd winter months when heating unit emissions are greatest. Measures to control pollution are most developed in Sheffield and least developed in Ljubjana. There is widespread awareness of air quality among the inhabitants of the three sites and they are generally able to identify the most and least polluted areas of their city. Socio-geographic investigations in Budapest and Sheffield indicate that there is a relationship between environmental quality and the income, education, and occupational backgrounds of residents. In none of the study sites were people prepared to admit their own contribution to pollution and restrict their own level of emissions. There was a marked tendency to perceive the clearly visible particulate pollution such as black or colored smoke, but to ignore the more dangerous, invisible pollutants. There is general ignorance regarding the type of gases involved. There was a broad range of complaints about air pollution, but few people said they would complain in the hope of stimulating some official action. (Author summary modified)

40141 **APTIC NO. 62088**

Wall, Geoffrey

PUBLIC RESPONSE TO AIR POLLUTION IN SOUTH YORKSHIRE, ENGLAND. *Environ. Behav., 5(2):219-248, June 1973. 14 refs.*

Public awareness and concern for atmospheric pollution in the South Yorkshire coalfield were investigated and compared to Sheffield. An interview survey of a quota sample of 40 residents was undertaken in each of three areas during March 1972. In both areas, respondents appeared to believe that the degree of air pollution can be judged by sight, and particulates were mentioned much more frequently than invisible gaseous pollutants, although sulfur dioxide is seldom present in sufficient quantities to smell. Respondents in both Sheffield and the coalfield exhibited considerable awareness of the smoke control legislation as it affected their home areas, and individual adjustments to mitigate the effects of air pollution varied very little. Declining pollution levels and the extensive adoption of smoke control legislaton have received considerable publicity in Sheffield and have encouraged residents of the city to regard air pillution as a problem which has been overcome. The marked differences in the rates of designation of smoke control zones do not reflect major differences in the perceptions or the desires of the local public. An overwhelming majority of respondents in all the study sites believed that smokeless zones are the best way to fight air pollution. (Author conclusions modified)

1972

40142 **APTIC NO. 61711**

Lee, Norman and P. J. W. Saunders

POLLUTION AS A FUNCTION OF AFFLUENCE AND POPULATION INCREASE. *In: Population and Pollution. P. R. Cox. and J. Peel (eds.), New York, Academic, 1972, p. 119-137. 16 refs. (Presented at the Proceedings of the Eighth Annual Symposium of the Eugenics Society, London, 1971.)*

The relationship between national increases in population and affluence and levels of pollution are examined particularly in Great Britain. Increases in affluence are seen as being the major determinant of increases in the total weight of wastes, but they also change the composition of wastes. Affluence also stimulates changes in technology and acts as the instrument for achieving still greater affluence. The effects of changing technology are superimposed upon the effects of increasing affluence on the composition of wastes. The increases in quantity and changes in composition of wastes must be related to the trend in the corresponding levels of pollution. There is evidence of trends in levels of waste and pollution where the latter conform to each other and also where they diverge or conflict. Part of the explanation of such variation lies in the institutional aspects of pollution control rather than in the direct influences of changes in population and affluence. Closer attention should be paid to the precise relationship between increasing affluence and the creation of potential polluting wastes and much uncertainty arises from the lack of knowledge of the relationships between trends in wastes and trends in pollution. (Author conclusions modified)

GENERAL

1974

40143 **APTIC NO. 62428**

Hales, Charles H., Alonzo M. Rollinson, and Frederick H. Shair

EXPERIMENTAL VERIFICATION OF LINEAR COMBINATION MODEL FOR RELATING INDOOR-OUTDOOR POLLUTANT CONCENTRATIONS. *Environ. Sci. Technol., 8(5):452-453, May 1974. 3 refs.*

The linear combination ventilation model appears to provide an upper bound in relating indoor concentration of ozone to that outside. Tests conducted with a rather large office laboratory indicated that the model is in excellent agreement with ozone concentrations in rooms; however, ozone concentrations vary somewhat from room to room depending on the local ventilation and geometric parameters. The model is based upon approximating the air flow throughout a building by means of a well-mixed chemical reactor wherein constant sources and first-order reactions can occur and various input and output streams are present.

40144 **APTIC NO. 62889**

Hoell, Wolfgang and Ruediger Hampp

LEAD IN THE BIOSPHERE, SOME ASPECTS. *(Blei inder Biosphaere, einige Aspekte). Text in German. Naturw. Rundschau, 27(7): 272-276, 1974. 25 refs.*

By far the largest amount of lead in the biosphere (about 98%) stems from the combustion of gasoline. In the Federal Republic of Germany the lead emission by automobiles rose 66% from 1965 to 1969. A reduction of the gasoline lead from 0.6 g/l to 0.44% g will not help much to reduce the lead content of the biosphere because of the steadily increasing number of automobiles. The lead emitted by automobile exhausts is primarily in the form of halides. Of this lead, 10 to 20% is present in the atmosphere in gaseous form, the rest in solid form in aerosols. The lead particle sizes range from 0.5 to 2 micron. Studies with Pb-210 revealed that lead in aerosols remains in the atmosphere up to 30 days which is long enough to spread it world-wide. Because of this world-wide presence, lead is adsorbed and accumulated in plants. Studies in Munich of the lead location in plants revealed a translocation of the once resorbed lead. The dangers of lead inhalation by humans, which leads to an accumulation of lead in the bones, are reviewed.

40145 **APTIC NO. 62480**

Ishizaka, Takashi

QUALITATIVE IDENTIFICATION OF AEROSOL PARTICLES. *(Erozoru ryushi no busshitsu dotei ni tsuite). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 11:23-45, Jan. 1974. 37 refs.*

Classifications of aerosol particles, aerosol elements and their identification methods, aerosols in the atmosphere, oceanic atmosphere, urban atmosphere, natural background, mountain air, salt particles, mineral particles, pollutants, carbon, tar, ashes, metals, volcanic emission particles, and aerosol concentration in the atmosphere are discussed. Aerosols in a polluted atmosphere contain aerosols from natural sources, pollutants directly emitted from urban emission sources, and particles formed by chemical reactions among various substances in the air. The major part of urban air particulates are created by combustion or incomplete combustion of fuels, such as carbon, tar, coke, and ash particles. Aerosol particles can contain 0.01-1 micron carbon, tar, and ashes. Metal particles of lead, iron, manganese, copper, calcium, and the oxides of these metals are emitted by ironworks, metal refineries, and automobiles. Microparticles of pesticide powder are also a source of aerosols. Much of sulfur oxide gases changes into sulfuric acid ions by photochemical or catalytic reactions and form sulfuric acid particles. The size is usually less than 0.1 micron. The concentration of H(+) and the concentrations of other ions or sulfur dioxide in the air have no direct relationship. The H(+) concentration in aerosols drastically increases under weather conditions conducive for fogs, or when strongly acidic aerosols are emitted by nearby factories.

40146 **APTIC NO. 62502**

Shair, Fredrick H. and Kenneth L. Heitner

THEORETICAL MODEL FOR RELATING INDOOR POLLUTANT CONCENTRATIONS TO THOSE OUTSIDE. *Environ. Sci. Technol., 8(5):444-451, May 1974. 19 refs.*

A general ventilation model, which relates indoor pollutant concentrations to those outside, is discussed in detail. When the time interval associated with changes in the outdoor concentration is long compared to that required either to change the air within the building or to remove the pollutant by internal means, the indoor concentration of pollutant can be related to the outdoor concentration by means of a simple expression. In the case of indoor ozone associated with buildings located in photochemically smoggy regions, there is good agreement between theory and experiment. Theoretical considerations suggest that the indoor levels of ozone in many commercial buildings located in Los Angeles could be substantially reduced rather quickly and possibly with relatively little effort. Based upon an analysis of several buildings on the Caltech campus, it appears that for air-conditioned buildings it would be rather easy to reduce the indoor ozone levels to 0.2 of those outside. If this were done, the indoor levels of ozone would exceed the threshold limit value of 0.1 ppm probably no more than four or five days a year, whereas the outdoor concentrations and current indoor concentrations typically exceed this value over 200 days each year. (Author abstract modified)

40147 **APTIC NO. 62884**

Vogel, Hermann Emil

FUTURE TASKS OF WATER PROTECTION AND AIR HYGIENE. *(Zukunftweisende Aufgaben bei Gewaesserschutz und Lufthygiene). Text in German. Wasser Energie., 66(6):195-198, 1974.*

Air pollution has increased over the past few years. Direct sources of air pollution are domestic heating, traffic, and industries. In 1963, 75,000 tons of coal and 125,000 tons of fuel oil were burned. During the heating period the daily sulfur dioxide emission amounted to 1.8 tons. The reduction of the sulfur dioxide concentrations in fuel oil reduced the SO2 concentration in the city s air from 0.035 ppm to 0.017 ppm. Efficient short-term measures for a reduction of the increasing air pollution include desulfurization of the fuel oil, periodic inspection and better maintenance of domestic heaters, laws and regulations requesting the reduction of emissions by automobiles and industries, promotion of the construction of remote heating plants, non-polluting energy carriers and measures for better insulation of buildings, and traffic-free city centers and by-pass routes containing long-distance traffic around cities.

1973

40148 **APTIC NO. 57951**

Stewart, Alice

WHY IT LOOKS AS THOUGH A LITTLE RADIATION IS GOOD FOR YOU. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1973. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-38, 1973, Paper 73-92.)*

The progress of preleukemia and leukemia is described. The research methodology which should be used in the study of leukemia is discussed. It is difficult to detect the leukemogenic effects of low level radiation unless one starts with a pollution of leukemia patients and works backwards. It is easy to record a deficit of nonradiogenic leukemias in a population exposed to diagnostic doses of radiation, and thus be left with the impression that the radiation had benefited the recipients. Various studies of the effects of x-rays and A-bomb radiation on children are discussed in light of their flaws.

40149 **APTIC NO. 62456**

Tokyo Metropolitan Government (Japan). Shibuya District Construction Pollution Dept.

PHOTOCHEMICAL SMOGS, 1973. *(Kokagaku sumoggu, 1973). Text in Japanese. 56p., Jan. 1974.*

In this report on photochemical smogs, the formation mechanisms in Los Angeles and Tokyo, meteorological conditions (sunshine, wind direction, wind speed, temperature), effects on the human body and plants, countermeasures by the Tokyo Metropolitan government and by the Shibuya District Office, smog warnings and predictions for photochemical smogs in 1972 and 1973, the numbers of victims in 1972 and 1973, symptoms of victims, meteorological data, oxidant measurement tables, and the relationship between victims and oxidant levels are discussed or presented in tables. The total hydrocarbons emission quantity in Tokyo is 4,291,000 tons, of which 25.1% is organic solvent, 57.3% automotive emissions, and 14.8% petroleum industries and sales. The total nitrogen oxides emission in Tokyo is 4,436,000 tons, of which 39% comes from automotive emissions, 21.5% from power industries, and 31% from industries. The number of photochemical victims in 1972 were 8433 in total Tokyo and 361 in Shibuya;, in 1973, 4035, and 92. The number of warnings were 31 in 1972 and 45 in 1973. The number of monthly victims were 1869 in July 1973, and 1097 in July 1972. In June 1972, 3814 were victimized but in June 1973, only about 400 were affected.

40150 **APTIC NO. 62457**

Itami Municipal Government (Japan)

A SURVEY OF POLLUTION. *(Kogai no gaikyo). Text in Japanese. 142p., Nov. 1973.*

A comprehensive report of investigations on various public nuisances in Itami conducted in 1972 is presented. The content includes an outline of pollution administration, complaints by citizens, air, water, noise pollution, and land settling. In the category of air pollution, environmental standards for sulfur oxides, carbon monoxide, settling particles, suspended particulates, nitrogen dioxide, photochemical oxidants, monitoring networks such as automatic monitoring, and automotive exhaust automatic measurement are discussed. Monitor cars, lead dioxide and deposit gauge measurements, smog countermeasures, pollution prevention agreements, photochemical smog countermeasures are some other topics covered. The measurements of settling particles, suspended particulates, and sulfur dioxide show decreasing tendencies over the past several years. The yearly average of nitrogen dioxide was 0.041 ppm for 1972, with the highest monthly average of 0.052 ppm in February and March. Both nitric oxide and NO2 show an increasing tendency. The yearly average of photochemical oxidant was 0.025 ppm for 1972, with a maximum monthly average of 0.046 ppm in May followed by 0.036 ppm in October. Warnings were issued twice in May, twice in July, and once in September and October.

40151 **APTIC NO. 62458**

Marugame Municipal Government (Japan), Dept. of Pollution and Traffic

THE STATE OF POLLUTION AND COUNTERMEASURES. *(Kogai no genjo to taisaku). Text in Japanese. 122p., Sept. 1973.*

In this comprehensive report of the Marugame Municipal Government pollution administration of the city, the results of investigation on air, water, noise, and bad odor pollution are discussed. Pollution complaints, special investigations on PCB and mercury, and special data gathered by the city are included. Under the topic of air pollution, the present condition and countermeasures, measurements of sulfur oxides levels measured by electroconductivity and lead dioxide, and measurements of settling particulates are included. Under the topic of bad odor, special controlled districts, controlled material, and regulation standards are presented. Presently, sulfur dioxide levels are continuously and automatically monitored at three locations in the city. The hourly average through the year was 0.029 ppm in 1973, compared with 0.026 ppm of 1972. The monthly maximum was 0.036 ppm of April and minimum was 0.018 ppm of February. Settling particles show a decreasing tendency in general. The maximum average in the city was 6.99 tons/sq km/month in the busiest district, and the minimum was 4.45 tons/sq km month. The highest monthly accumulation of settling particles was 20.82 tons in Feb. 1973 in the (same) busiest district.

40152 **APTIC NO. 62559**

Canadian Dept. of Energy, Mines and Resources

TECHNOLOGY AND ENVIRONMENTAL CONCERNS (FINAL REPORT). *In: Annual Report 1972-73, p. 20-28, 1973 (?).*

A report is presented on technological and environmental research activities of the Canadian Department of Energy, Mines and Resources for the period 1972-1973. Topics covered include: fuel technology, automation in surveying and instrumentation, metallurgical technology, ore treatment, mining engineering, conversion of waste products into useful products, analytical standards, mine safety, remote sensing by aircraft and satellite, environmental concerns such as reduction of atmospheric pollution from automobile operation and industrial plants, geological studies of areas exploited for energy, safety and pollution abatement in mining and metallurgy, earthquake hazard studies, and ice dynamics studies involving the transfer of kinetic and thermal energy between the atmosphere and the ocean through a complete or partial ice cover.

1972

40153 **APTIC NO. 62037**

Clayton, George D.

AIR POLLUTION. *In: Industrial Environmental Health. The Worker and the Community. Lester V. Cralley (ed.). New York, Academic Press, 1972, p. 411-454. 14 refs.*

Legal factors regarding air pollution are reviewed including legislation passed since the Air Quality Act of 1967. The Federal, state, local, and public functions in air pollution control are mentioned. Economic incentives to air pollution control are mentioned. Mobile source emission control possibilities include fuel additives, emission testing and inspection, diesel engine emission control, mass transit, catalysts, and advanced propulsion systems. Stationary source emission control possibilities include plant siting, control of large fossil-fuel combustion sources, fuel conversion and coal gasification, nuclear power, and development of efficient power production, power transmission, and heating systems. Toxic effects of pollution, analytical methods and instrumentation development, ambient air monitors, stack sampling and analysis, meteorologic problems and considerations, and expanded forecasts are mentioned. The Clean Air Act and its Amendments of 1970 are described. Emission standards for incineration, fuel burning equipment, and process industries, episode criteria, manpower and training needs, and air quality standards are listed. United States air quality data is summarized.

SUBJECT INDEX

A

ABATEMENT
38926, 38953, 38956, 39708, 40009, 40010, 40011, 40013, 40014, 40016, 40020, 40047, 40091, 40093, 40099, 40105, 40120, 40124, 40125, 40128, 40129, 40137, 40153

ABSORPTION (CONTROL)
38857, 38862, 38974, 38975, 38977, 38978, 38994, 39001, 39019, 39023, 39025, 39055, 39066, 39107, 39115, 39122, 39154, 39187, 39234, 39256, 39271, 39273, 39289, 39292, 39310, 39312, 39313, 39341, 39348, 39388, 39399, 39401, 39402, 39441, 39494, 39495, 39514, 39549, 39573, 39728, 39788, 39792, 39881, 39885, 39908, 39986, 39991

ABSORPTION (GENERAL)
39013, 39023, 39027, 39034, 39035, 39045, 39046, 39070, 39075, 39084, 39091, 39100, 39101, 39110, 39125, 39135, 39138, 39147, 39152, 39153, 39162, 39164, 39173, 39193, 39194, 39197, 39207, 39208, 39218, 39219, 39223, 39225, 39231, 39235, 39248, 39255, 39259, 39268, 39280, 39290, 39302, 39311, 39317, 39325, 39332, 39351, 39378, 40005, 40008, 40092

ACETALDEHYDE
38878

ACETIC ACID
38878, 39939, 39982

ACETYLENES
39401, 39515, 39520, 39760

ACID SMUTS
39288

ACROLEIN
39738, 40096

ACUTE
39850, 39882, 39892, 39896, 39936

ADAPTATION
39821, 39938, 39965

ADENOVIRUS INFECTIONS
39870

ADHESIVES
39092

ADSORPTION (CONTROL)
38857, 38862, 38975, 38977, 38995, 39006, 39012, 39017, 39026, 39044, 39051, 39059, 39064, 39066, 39088, 39109, 39112, 39154, 39165, 39187, 39204, 39271, 39272, 39278, 39289, 39303, 39341, 39357, 39358, 39362, 39373, 39381, 39382, 39402, 39471, 39473, 39507, 39551, 39611, 39701, 39726, 39730, 39731, 39732, 39749, 39780, 39999, 40006, 40144

ADSORPTION (GENERAL)
39034, 39035, 39091, 39101, 39211, 39231, 39351

ADVECTION
39696

ADVISORY SERVICES
40085, 40110, 40112

AERODYNAMICS
38909, 39552, 39722, 39771

AEROSOL ATOMIZATION
39345, 39440, 39750

AEROSOL DIFFUSION AND BROWNIAN MOTION
39632, 39779

AEROSOL PHENOMENA
38855, 38860, 38889, 38972, 38989, 38991, 39012, 39018, 39060, 39077, 39100, 39139, 39183, 39223, 39240, 39246, 39260, 39330, 39336, 39338, 39345, 39346, 39352, 39397, 39403, 39404, 39408, 39422, 39436, 39440, 39444, 39446, 39451, 39455, 39459, 39463, 39497, 39503, 39535, 39541, 39548, 39552, 39553, 39556, 39562, 39574, 39587, 39615, 39625, 39630, 39632, 39635, 39642, 39652, 39660, 39672, 39682, 39685, 39695, 39699, 39711, 39721, 39744, 39750, 39777, 39779, 39859, 39940, 40138, 40144

AEROSOLS
38864, 38889, 38991, 39018, 39037, 39260, 39345, 39346, 39382, 39400, 39404, 39407, 39409, 39424, 39428, 39429, 39432, 39438, 39444, 39456, 39475, 39476, 39497, 39508, 39516, 39519, 39522, 39535, 39541, 39547, 39552, 39553, 39562, 39574, 39620, 39630, 39632, 39633, 39634, 39637, 39645, 39647, 39648, 39649, 39650, 39655, 39658, 39660, 39672, 39678, 39680, 39681, 39682, 39685, 39689, 39692, 39698, 39705, 39711, 39723, 39750, 39759, 39777, 39782, 39786, 39790, 39830, 39844, 39858, 39859, 39889, 39894, 39913, 39940, 39992, 40029, 40045, 40096, 40144, 40145

AFRICA
38861, 39648, 39912, 40047

AGRICULTURAL CHEMICAL PLANTS
38908, 38936, 39491, 40006

AGRICULTURAL SERVICES
39880, 39883, 39884

AGRICULTURE INDUSTRY
38985, 39880, 39883, 39884, 39969

AIR CONDITIONING EQUIPMENT
39185, 39615, 39723, 39921, 40146

AIR POLLUTION EPISODES
39384, 39395, 39502, 39544, 39579, 39585, 39834, 39835, 39882, 39900, 39904, 39974, 39979, 40065, 40107, 40110, 40113, 40149

AIR POLLUTION FORECASTING
38866, 38939, 38963, 39287, 39395, 39627, 39639, 39661, 39676, 39693, 39709, 39719, 39720, 40010, 40013, 40014, 40023, 40107, 40110, 40120, 40132, 40135

AIR QUALITY CRITERIA
39592, 40034, 40037, 40039, 40049, 40108, 40113, 40115

AIR QUALITY MEASUREMENT PROGRAMS
38852, 38890, 38919, 38969, 39363, 39384, 39395, 39426, 39433, 39434, 39448, 39469, 39502, 39527, 39543, 39545, 39557, 39572, 39576, 39580, 39581, 39582, 39583, 39584, 39585, 39586, 39589, 39590, 39591, 39592, 39593, 39594, 39595, 39598, 39599, 39600, 39601, 39603, 39605, 39607, 39613, 39614, 39618, 39623, 39629, 39631, 39635, 39672, 39678, 39679, 39685, 39686, 39702, 39793, 39801, 39802, 39810, 39811, 39812, 39820, 39826, 39827, 39828, 39829, 39834, 39850, 39866, 39867, 39871, 39904, 39914, 39952, 39963, 39964, 39971, 39977, 39978, 39979, 40023, 40036, 40037, 40038, 40040, 40043, 40045, 40072, 40094, 40096, 40109, 40114, 40116, 40117, 40135, 40140, 40149, 40150, 40151

AIR QUALITY STANDARDS
38875, 38904, 38931, 38941, 39134, 39139, 39408, 39480, 39524, 39530, 39584, 39585, 39717, 39793, 39830, 39836, 39918, 39921, 40010, 40018, 40023, 40028, 40029, 40031, 40033, 40040, 40044, 40045, 40056, 40064, 40065, 40066, 40074, 40075, 40078, 40079, 40080, 40089, 40090, 40093, 40095, 40100, 40101, 40115, 40117, 40120, 40122, 40123, 40150, 40151, 40153

AIR RESOURCE MANAGEMENT
38902, 38953, 38957, 38963, 39606, 39618, 40018, 40026, 40034, 40037, 40038, 40040, 40049, 40050, 40091, 40097, 40108, 40115, 40117, 40118, 40119, 40120, 40121, 40125, 40126, 40130, 40132, 40133, 40134, 40135, 40136, 40137

AIR-FUEL RATIO
38855, 38880, 38885, 38887, 38893, 39015, 39022, 39042, 39047, 39083, 39127, 39136, 39140, 39156, 39178, 39186, 39190, 39209, 39215, 39226, 39236, 39253, 39265, 39288, 39291, 39297, 39298, 39340, 39354, 39758, 39760, 39774

AIRCRAFT
38852, 38861, 38894, 38896, 38897, 38900, 38901, 38906, 38913, 38933, 38940, 38967, 39042, 39047, 39079, 39127, 39156, 39188, 39240, 39253, 39301, 39355, 39388, 39443, 39465, 39474, 39478, 39479, 39484, 39628, 39631, 39645, 39661, 39663, 39665, 39673, 39685, 39694, 39757, 39838, 40126

AIRPORTS
38852, 38897, 38906, 38940, 38967, 39301, 40126

AITKEN COUNTERS
39535

ALABAMA
40067

ALASKA
40026, 40082

ALCOHOLS
38853, 38862, 38975, 39019, 39286, 39289, 39341, 39353, 39391, 39494, 39765, 39830, 39909, 39961

ALDEHYDES
38867, 38878, 38913, 39094, 39191, 39289, 39341, 39381, 39411, 39589, 39590, 39738, 39834, 39858, 39859, 39961, 40096

ALERTS
39384, 39395, 39502, 39544, 39579, 40107, 40110, 40149

ALKALINE ADDITIVES
39007, 39023, 39045, 39046, 39084, 39100, 39110, 39164, 39169, 39197, 39208, 39223, 39235, 39268, 39302, 39317, 39332, 39351, 40005, 40008, 40092

ALLERGIES
39847, 39854, 39857, 39888, 39900, 39914, 39929

ALPHA PARTICLES
39186

ALUMINUM
39261, 39731, 39736, 39791, 39867, 40105

ALUMINUM OXIDES
39091, 39698

ALVEOLI
39503, 39803, 39804, 39821, 39856, 39859, 39876, 39893, 39905, 39927

AMIDES
39115, 39569, 39765, 39973

AMINES
38875, 38975, 39115, 39270, 39341, 39493, 39501, 39999

AMINO ACIDS
39804, 39809, 39854, 39865, 39968, 39987

AMMONIA
38874, 38875, 39006, 39012, 39027, 39054, 39059, 39094, 39105, 39112, 39289, 39309, 39341, 39353, 39391, 39404, 39430, 39435, 39490, 39501, 39513, 39515, 39520, 39571, 39647, 39733, 39755, 39961, 39986

AMMONIUM COMPOUNDS
38851, 38874, 38875, 38936, 39006, 39012, 39027, 39054, 39059, 39094, 39105, 39112, 39270, 39289, 39309, 39325, 39341, 39353, 39391, 39393, 39404, 39430, 39435, 39476, 39490, 39501, 39513, 39515, 39520, 39571, 39634, 39642, 39647, 39650, 39698, 39733, 39755, 39961, 39986

ANEMIA
39848

ANIMALS (NON-HUMAN)
38930, 38969, 38985, 39794, 39795, 39800, 39803, 39804, 39816, 39817, 39819, 39821, 39822, 39830, 39832, 39836, 39837, 39838, 39840, 39842, 39843, 39844, 39851, 39852, 39856, 39863, 39870, 39873, 39876, 39885, 39887, 39897, 39901, 39911, 39912, 39922, 39924, 39925, 39938, 39993, 39994

ANTIBODIES
39844, 39854, 39886

ANTIDOTES
39941, 39946

ANTIGENS
39847, 39853, 39886

ANTIMONY COMPOUNDS
39488, 39696

AREA EMISSION ALLOCATIONS
40038, 40039, 40100

AREA SURVEYS
38852, 38890, 38919, 38969, 39384, 39395, 39469, 39527, 39572, 39576, 39580, 39581, 39582, 39583, 39584, 39585, 39586, 39589, 39590, 39591, 39592, 39593, 39594, 39595, 39598, 39599, 39600, 39601, 39603, 39605, 39607, 39613, 39614, 39618, 39623, 39629, 39631, 39635, 39672, 39678, 39679, 39685, 39686, 39702, 39802, 39810, 39811, 39812, 39820, 39826, 39827, 39828, 39829, 39834, 39866, 39867, 39871, 39904, 39914, 39952, 39963, 39964, 39971, 39977, 39978, 39979, 40037, 40045, 40094, 40096, 40109, 40116, 40117, 40140, 40149, 40150, 40151

AROMATIC HYDROCARBONS
38862, 38877, 38910, 38957, 39089, 39105, 39256, 39289, 39341, 39381, 39385, 39401, 39402, 39494, 39765, 39808, 39936, 39961, 40151

ARSENIC COMPOUNDS
38919, 38944, 38969, 39228, 39442, 39488, 39516, 39551, 39696, 39807, 39864, 39918, 39926, 39942, 39943, 39944, 39945, 39946, 39947, 39948, 39949, 39950, 39951

ASBESTOS
39012, 39313, 39394, 39446, 39459, 39516, 39555, 39612, 39912, 39913, 39932, 40053, 40127

ASHES
38915, 38968, 38970, 39155, 40070

ASPHALT
39280, 39320, 40027

ASTHMA
39802, 39810, 39814, 39833, 39854, 39855, 39857, 39860, 39887, 39893, 39900, 39914, 39917, 39923, 39929

ATMOSPHERIC MOVEMENTS
38860, 38889, 38899, 38924, 39384, 39465, 39521, 39531, 39572, 39579, 39582, 39583, 39587, 39590, 39599, 39607, 39609, 39613, 39616, 39617, 39623, 39624, 39626, 39627, 39629, 39638, 39639, 39640, 39643, 39644, 39651, 39652, 39653, 39656, 39657, 39660, 39662, 39666, 39669, 39674, 39677, 39683, 39684, 39685, 39686, 39689, 39691, 39693, 39695, 39696, 39704, 39705, 39707, 39712, 39714, 39715, 39722, 39725, 39727, 39759, 39773, 39834, 40096, 40109

AUSTRALASIA
39572, 39965, 40109

AUSTRALIA
39572, 39965, 40109

AUTOMATIC MEASUREMENT METHODS
39384, 39433, 39434, 39459, 39466, 39475, 39492, 39509, 39510, 39516, 39523, 39534, 39548, 39561, 39563, 40116, 40134, 40152

AUTOMOBILES
38852, 38858, 38887, 38893, 38902, 38920, 38930, 38939, 38980, 38996, 39065, 39072, 39078, 39149, 39163, 39166, 39181, 39190, 39196, 39216, 39247, 39250, 39251, 39254, 39266, 39296, 39298, 39314, 39330, 39353, 39462, 39576, 39590, 39591, 39594, 39614, 39787, 39805, 39824, 40104, 40108

AUTOMOTIVE EMISSION CONTROL
38847, 38855, 38858, 38870, 38880, 38885, 38887, 38888, 38892, 38893, 38909, 38939, 38948, 38980, 38984, 38997, 38999, 39000, 39004, 39015, 39022, 39030, 39042, 39047, 39052, 39058, 39072, 39078, 39083, 39097, 39116, 39119, 39121, 39123, 39126, 39127, 39130, 39131, 39132, 39133, 39136, 39140, 39143, 39144, 39145, 39148, 39149, 39156, 39159, 39160, 39166, 39170, 39171, 39172, 39174, 39175, 39177, 39178, 39179, 39180, 39181, 39186, 39188, 39189, 39190, 39191, 39196, 39198, 39199, 39200, 39202, 39203, 39205, 39206, 39209, 39213, 39214, 39215, 39216, 39217, 39224, 39226, 39228, 39236, 39238, 39240, 39242, 39243, 39247, 39249, 39251, 39253, 39254, 39262, 39264, 39265, 39266, 39282, 39284, 39285, 39286, 39287, 39288, 39291, 39296, 39297, 39298, 39300, 39305, 39306, 39319, 39324, 39326, 39330, 39340, 39343, 39354, 39355, 39357, 39361, 39366, 39368, 39371, 39758, 39760, 39774, 39808, 40052, 40054, 40060, 40104

AUTOPSY
39873, 39909, 39932, 39946

AZO DYE
39412

B

BACTERIA
39775, 39844, 39853, 39889, 39893, 39972

BAFFLES
39124, 39210, 39260, 39358, 39369

BAG FILTERS
38860, 38943, 38962, 38974, 38979, 39018, 39023, 39041, 39060, 39074, 39111, 39139, 39328, 39334, 39336, 39346, 39563

BARIUM COMPOUNDS
39488, 39916

BASIC OXYGEN FURNACES
39096, 39327, 39375, 39377

BATTERY MANUFACTURING
38930

BELGIUM
38926, 39413, 39424, 39646, 39693, 39702, 39974, 40105

BENZENES
38877, 39105, 39256, 39341, 39765, 39961

BENZO(3-4)PYRENE
38966, 39600, 39612, 39806, 39840, 39852, 39875, 39902

BENZOPYRENES
38966, 39600, 39612, 39806, 39840, 39852, 39875, 39902

BERYLLIOSIS
39816, 39886, 39887, 39921

BERYLLIUM
39898

BERYLLIUM COMPOUNDS
39394, 39488, 39551, 39634, 39816, 39886, 39898, 39921, 40053, 40127

BETA PARTICLES
39186, 39492, 39523

BIO-ASSAY
39532, 39804, 39809, 39854

BIOCHEMISTRY
39804, 39809, 39819, 39828, 39854, 39865, 39906, 39924, 39927, 39942, 39968, 39987

BIOCLIMATOLOGY
38900, 39871, 39900, 39960, 39990

BIOLOGICAL FACTORS
39804, 39809, 39819, 39828, 39854, 39865, 39906, 39924, 39927, 39942, 39968, 39987

BIRDS
39870, 39994

BLACK LIQUOR OXIDATION
38975

BLAST FURNACE AND BASIC STEEL PRODUCTS M
38954, 38988, 39060, 39234, 39327, 39742, 40012

BLAST FURNACES
38988, 39327, 39742, 40012

BLOOD CELLS
39789, 39848, 39865, 39866, 39925, 39942, 39946, 39948

BLOOD CHEMISTRY
39549, 39787, 39788, 39789, 39792, 39795, 39801, 39811, 39812, 39824, 39826, 39829, 39831, 39854, 39865, 39866, 39934, 39942, 39944, 39946, 39947, 39948, 39994

BLOOD GAS ANALYSIS
39862, 39877

BLOOD PRESSURE
39823

BLOOD VESSELS
39817, 39870

BLOWBY
39354, 39357

BODIES OF WATER
38861, 38890, 39541, 39573, 39577, 39578, 39647, 39648, 39672, 39679, 39682, 39685, 39695, 39696, 39705, 39722, 39727, 39977, 39979, 40096

BODY FLUIDS
39927, 39933, 39951

BOILERS
38853, 38859, 38871, 38872, 38873, 38904, 38971, 38974, 38983, 38998, 39024, 39029, 39060, 39070, 39073, 39084, 39107, 39108, 39110, 39153, 39167, 39185, 39192, 39193, 39194, 39226, 39227, 39237, 39255, 39279, 39281, 39283, 39302, 39304, 39331, 39333, 39364, 39604, 40028, 40032

BONES
39787, 39813, 39849, 39871, 39946, 39947, 39951, 39994, 40144

BORON COMPOUNDS
39488

BREATHING
39799, 39810, 39820, 39825, 39840, 39895, 39899, 40144

BRICKS
38954, 39063

BROMIDES
38992, 39157, 39698

BROMINE COMPOUNDS
38992, 39157, 39442, 39698

BRONCHI
39797, 39817, 39821, 39855, 39857, 39859, 39870, 39893, 39910, 39917, 39925, 39927, 39933

BRONCHIAL CANCER
39841

BRONCHITIS
39799, 39802, 39814, 39823, 39842, 39845, 39854, 39860, 39877, 39887, 39893, 39900, 39907, 39909, 39914, 39923, 39925, 39928

BRONCHOCONSTRICTION
39857

BRONCHODILATORS
39940

BROWNIAN MOTION
39632, 39779

BUBBLE CAP TOWERS
39102

BUILDINGS
38897, 39026, 39502, 39600, 39790, 39980, 39998, 40044, 40143, 40146

BURNING
38917, 38925, 39785, 40113

BUSES
39319, 39872

BUTADIENES
39385

BUTENES
38871

BY-PRODUCT RECOVERY
38851, 38856, 38879, 38895, 38908, 38962, 38983, 38986, 38992, 38998, 39003, 39011, 39024, 39032, 39035, 39036, 39043, 39051, 39063, 39070, 39087, 39098, 39106, 39108, 39112, 39117, 39135, 39138, 39150, 39155, 39169, 39172, 39182, 39195, 39205, 39207, 39212, 39218, 39219, 39223, 39230, 39232, 39233, 39246, 39248, 39259, 39260, 39268, 39269, 39272, 39280, 39293, 39294, 39311, 39317, 39322, 39327, 39332, 39342, 39348, 39364, 39367, 39372, 39373, 39375, 39378, 39379, 39749, 40004, 40012, 40018, 40068, 40108, 40152

C

CABBAGE
39982

CADMIUM COMPOUNDS
38889, 38944, 39413, 39432, 39442, 39476, 39488, 39516, 39551, 39602, 39614, 39727, 39801, 39843, 39863, 39881, 39892, 39905, 39906, 39909, 39911, 39938, 39992, 40127

CALCIUM COMPOUNDS
38851, 39100, 39118, 39197, 39223, 39235, 39290, 39698, 39843, 39957

CALCIUM SULFATES
38851, 39118

CALIBRATION METHODS
39058, 39399, 39403, 39405, 39416, 39417, 39435, 39437, 39500, 39524, 39881, 40030, 40063

CALIFORNIA
38849, 38883, 38935, 39166, 39319, 39469, 39598, 39622, 39631, 39644, 39661, 39679, 39718, 39737, 39806, 39996, 40050, 40130

CAMERAS
39997

CANADA
38926, 38930, 39117, 39322, 39378, 39393, 39431, 39681, 39753, 40102, 40152

CANCER
39806, 39807, 39816, 39841, 39855, 39868, 39875, 39882, 39902, 39909, 40148

CARBON
38882, 38975, 38994, 39027, 39051, 39059, 39064, 39128, 39204, 39228, 39246, 39306, 39351, 39373, 39422, 39473, 39600, 39740, 39744, 39749, 39752, 39767, 39786, 39797, 39999, 40098

CARBON BLACK
38975, 38994, 39027, 39059, 39064, 39128, 39204, 39228, 39246, 39306, 39351, 39373, 39422, 39473, 39600, 39740, 39744, 39749, 39752, 39767, 39786, 39797, 40098

CARBON DIOXIDE
38854, 38868, 38899, 38903, 38907, 38933, 38935, 38978, 39115, 39122, 39141, 39201, 39292, 39356, 39384, 39412, 39416, 39418, 39433, 39447, 39490, 39506, 39513, 39515, 39520, 39578, 39611, 39772, 39775, 39877, 39933

CARBON DISULFIDE
39154, 39187, 39233, 39362, 39515, 39520, 39611, 39765

CARBON MONOXIDE
38847, 38849, 38852, 38854, 38858, 38866, 38868, 38883, 38887, 38890, 38893, 38894, 38896, 38899, 38901, 38903, 38906, 38907, 38908, 38909, 38911, 38913, 38920, 38925, 38931, 38935, 38939, 38941, 38947, 38952, 38958, 38959, 38966, 38967, 38984, 38996, 39001, 39004, 39009, 39012, 39015, 39022, 39026, 39042, 39047, 39052, 39065, 39076, 39078, 39080, 39099, 39126, 39127, 39128, 39130, 39131, 39132, 39145, 39148, 39149, 39154, 39163, 39170, 39178, 39184, 39190, 39191, 39199, 39200, 39201, 39203, 39205, 39215, 39216, 39217, 39236, 39249, 39250, 39251, 39253, 39254, 39261, 39265, 39287, 39288, 39289, 39296, 39297, 39298, 39319, 39340, 39354, 39357, 39361, 39375, 39388, 39394, 39406, 39416, 39418, 39420, 39421, 39424, 39433, 39434, 39447, 39474, 39476, 39484, 39502, 39504, 39515, 39517, 39520, 39521, 39524, 39529, 39575, 39576, 39583, 39584, 39585, 39589, 39594, 39598, 39603, 39605, 39606, 39611, 39617, 39626, 39645, 39665, 39700, 39732, 39741, 39758, 39766, 39772, 39774, 39808, 39818, 39825, 39827, 39834, 39836, 39838, 39840, 39846, 39868, 39869, 39872, 39913, 39933, 39935, 39952, 39967, 40003, 40024, 40037, 40077, 40096, 40108, 40116, 40123, 40150

CARBON TETRACHLORIDE
38910, 39515, 39520

CARBONATES
39027, 39157, 39235, 39698

CARBONYLS
39081, 39233, 39289, 39365, 39379, 39511, 39512, 39905

CARBOXYHEMOGLOBIN
39818, 39836, 39838, 39869, 39935

CARBURETION
38870, 38948, 39130, 39172, 39186, 39216, 39249

CARBURETOR EVAPORATION LOSSES
39114, 39357

CARCINOGENS
38960, 39012, 39264, 39612, 39797, 39841, 39852, 39873, 39875, 39878, 39879, 39880, 39881, 39883, 39884, 39902, 39910, 39913

CARDIOVASCULAR DISEASES
39823, 39848, 39868, 39903, 39904, 39909

CASCADE IMPACTORS
39397, 39422, 39424, 39438, 39497, 39699

CATALYSIS
38993, 38999, 39009, 39013, 39026, 39027, 39031, 39048, 39049, 39051, 39052, 39078, 39080, 39103, 39107, 39109, 39117, 39146, 39163, 39230, 39232, 39233, 39249, 39261, 39271, 39303, 39314, 39340, 39343, 39351, 39361, 39506, 39517, 39579, 39673, 39731, 39732, 39733, 39736, 39741, 39743, 39754, 39776, 39999, 40145

CATALYSTS
38993, 38999, 39009, 39013, 39026, 39027, 39031, 39048, 39049, 39052, 39078, 39103, 39107, 39109, 39146, 39163, 39230, 39232, 39233, 39249, 39261, 39314, 39340, 39343, 39351, 39361, 39579, 39731, 39733, 39736, 39741, 39743, 39754, 39776, 39999

CATALYTIC ACTIVITY
38993, 39013, 39048, 39049, 39051, 39080, 39103, 39107, 39117, 39146, 39230, 39261, 39271, 39340, 39361, 39506, 39517, 39673, 39731, 39732, 39736, 39741, 39743, 39754, 40145

CATALYTIC AFTERBURNERS
38854, 38857, 38904, 38948, 38999, 39022, 39039, 39080, 39103, 39108, 39109, 39130, 39154, 39165, 39172, 39178, 39204, 3926, 39243, 39261, 39262, 39314, 39326, 39341, 39343, 39354, 39357, 39366, 40006

CATALYTIC OXIDATION
38857, 38968, 38975, 38977, 38993, 38994, 39017, 39026, 39048, 39099, 39108, 39163, 39218, 39249, 39289, 39305, 39341, 39351, 39361, 39365, 39379, 39480, 39732, 39733, 39743

CATS
39794, 39836, 39837

CATTLE
38985

CELL GROWTH
39823, 39856, 39865, 39924, 39925, 39934, 39958

CELL METABOLISM
39804, 39811, 39821, 39856, 39871, 39925, 39927, 39957, 39958, 39968, 39975, 39987

CELLS (BIOLOGY)
39789, 39803, 39804, 39817, 39821, 39848, 39851, 39865, 39866, 39870, 39876, 39912, 39925, 39927, 39933, 39942, 39946, 39948

CEMENTS
38916, 38954, 38955, 38979, 39020, 39060, 39084, 39195, 39219, 40012, 40022, 40042

CENTRIFUGAL SEPARATORS
38916, 38943, 38983, 38988, 39027, 39028, 39053, 39056, 39060, 39069, 39104, 39169, 39183, 39220, 39234, 39246, 39260, 39336, 39338, 39346, 39352, 39408, 39455, 39552, 40000

CERAMICS
39039, 39224, 39323, 39451, 39491

CESIUM COMPOUNDS
39915

CHARCOAL
38882, 39051, 39999

CHEMICAL BONDS
39730, 39747, 39748, 39786

CHEMICAL COMPOSITION
38855, 38889, 38919, 38960, 39077, 39195, 39240, 39385, 39390, 39397, 39413, 39417, 39419, 39422, 39424, 39432, 39442, 39452, 39462, 39467, 39496, 39498, 39516, 39526, 39542, 39573, 39580, 39586, 39587, 39591, 39593, 39601, 39602, 39603, 39614, 39650, 39658, 39660, 39678, 39709, 39720, 39727, 39790, 39812, 39884, 39918, 40116, 40139, 40145

CHEMICAL METHODS
38937, 39069, 39107, 39393, 39409, 39411, 39412, 39424, 39471, 39491, 39498, 39500, 39510, 39511, 39514, 39551, 39586, 39768, 39993, 40096

CHEMICAL PROCESSES
39337

CHEMICAL PROCESSING
38874, 38878, 38882, 38919, 38936, 38937, 38945, 38983, 38992, 38993, 38998, 39010, 39049, 39069, 39070, 39105, 39112, 39154, 39182, 39187, 39268, 39269, 39278, 39294, 39307, 39332, 39336, 39349, 39370, 39373, 39384, 39953, 40028, 40032

CHEMICALS AND ALLIED MANUFACTURING
38862, 38908, 38930, 38936, 38949, 38993, 39491, 39913, 40006

CHIBA PREFECTURE
39607, 39623, 39833

CHICAGO
38889, 38907, 39422, 39657, 40007, 40100

CHLORATES
39401

CHLORIDES
38983, 39025, 39045, 39100, 39157, 39289, 39511, 39512, 39698, 39837, 39843, 39958, 39968

CHLORINATED HYDROCARBONS
38881, 38910, 38912, 38957, 39381, 39515, 39520, 39559, 39577, 39706, 39851, 39896, 39901, 40151

CHLORINE
38870, 39012, 39182, 39278, 39289, 39435, 39476, 39511, 39512, 39513, 39518, 39967, 39968

CHLORINE COMPOUNDS
38983, 39025, 39045, 39100, 39157, 39289, 39303, 39401, 39511, 39512, 39698, 39837, 39843, 39878, 39879, 39880, 39883, 39952, 39958, 39968

CHLOROPLASTS
39958, 39968, 39988

CHLOROSIS
39974, 39976, 39977, 39979, 39980, 39985

CHROMATOGRAPHY
39006, 39213, 39381, 39386, 39396, 39400, 39401, 39402, 39410, 39411, 39412, 39418, 39421, 39424, 39425, 39433, 39441, 39447, 39458, 39462, 39480, 39481, 39485, 39487, 39504, 39507, 39509, 39529, 39537, 39554, 39559, 39566, 39569, 40096

CHROMIUM
39078, 39731, 39732, 39736, 39898

CHROMIUM COMPOUNDS
39442, 39488, 39551, 39624, 39625, 39727, 39812, 39847, 39888, 39898, 39915, 39918, 40127

CILIA
39821, 39851, 39870, 39876, 39933

CINDERS
39069, 39742

CIRCULATORY SYSTEM
39817, 39848, 39870, 39904, 39942

CITRUS
39981

CITY GOVERNMENTS
39585, 40042, 40116, 40151

CLEAN AIR ACT
38892, 39078, 39808, 40018, 40058, 40068, 40070, 40072, 40074, 40075, 40080, 40092, 40095, 40100, 40101

CLOUDS
39463, 39599, 39616, 39624, 39633, 39635, 39637, 39648, 39652, 39679, 39684, 39688, 39689, 39711, 39784

COAL
38851, 38853, 38863, 38874, 38916, 38929, 38930, 38936, 38943, 38958, 38960, 38971, 38996, 39029, 39046, 39085, 39092, 39151, 39153, 39161, 39162, 39195, 39227, 39241, 39290, 39294, 39302, 39352, 39372, 39403, 39422, 39452, 39467, 39492, 39597, 39733, 39749, 39953, 40005, 40008, 40012, 40018, 40067, 40070, 40092, 40147

COAL CONVERSION
38882, 38884, 38918, 38998, 39027, 39035, 39036, 39040, 39081, 39082, 39125, 39140, 39141, 39142, 39150, 39158, 39162, 39173, 39192, 39193, 39212, 39225, 39229, 39235, 39248, 39257, 39272, 39275, 39350, 39733

COAL PREPARATION
38928, 39002, 39161, 39352, 39372

COBALT COMPOUNDS
39091, 39732, 39847, 39888, 39915, 39919

COKE
38863, 38874, 38882, 38904, 38954, 38998, 39105, 39226, 39241, 39307, 39348, 39349, 39356, 39370, 39530, 39600

COLLECTORS (MECHANICAL)
38908, 38916, 38943, 38983, 38988, 39008, 39013, 39018, 39027, 39028, 39053, 39054, 39056, 39060, 39069, 39104, 39113, 39124, 39169, 39183, 39210, 39220, 39234, 39246, 39260, 39307, 39328, 39336, 39338, 39346, 39347, 39349, 39352, 39358, 39369, 39370, 39375, 39408, 39455, 39494, 39495, 39552, 39777, 40000

COLORADO
38907, 40061

COLORIMETRY
39380, 39390, 39412, 39420, 39424, 39489, 39491, 39512, 39550, 39570, 39596, 40096

COLUMN CHROMATOGRAPHY
39006, 39559

COMBUSTION
38848, 38869, 38909, 38911, 38913, 38928, 38937, 38947, 38953, 38993, 39042, 39068, 39076, 39098, 39136, 39151, 39156, 39184, 39186, 39222, 39277, 39281, 39283, 39301, 39303, 39355, 39375, 39456, 39458, 39578, 39744, 39745, 39756, 39758, 39760, 39767, 39771, 39785

COMBUSTION AIR
38859, 38871, 38873, 38915, 38959, 38966, 38971, 38996, 39004, 39009, 39050, 39058, 39071, 39073, 39116, 39136, 39151, 39158, 39184, 39204, 39209, 39222, 39227, 39239, 39271, 39281, 39283, 39285, 39288, 39290, 39305, 39316, 39340, 39360, 39458, 39761, 39774

COMBUSTION PRODUCTS
38848, 38869, 38885, 38895, 38914, 38915, 38918, 38919, 38936, 38937, 38943, 38947, 38958, 38964, 38966, 38968, 38970, 39027, 39062, 39068, 39069, 39125, 39136, 39137, 39140, 39147, 39150, 39153, 39155, 39162, 39173, 39192, 39193, 39194, 39201, 39208, 39225, 39235, 39255, 39257, 39272, 39275, 39279, 39288, 39293, 39302, 39412, 39606, 39742, 39744, 39745, 39772, 40070, 40116, 40137, 40145

COMMERCIAL EQUIPMENT
39056, 39110, 39505, 39506, 39507, 39508, 39509, 39510, 39511, 39512, 39513, 39514, 39515, 39516, 39517, 39518, 39519, 39520, 39521, 39522, 39523, 39524, 39881

COMMERCIAL FIRMS
39056, 39152, 40052, 40054, 40064, 40066, 40105

COMPLAINTS
38969, 39572, 39583, 39584, 39585, 40140, 40149, 40150, 40151

COMPLIANCE (RESPIRATORY)
39862, 40049, 40060, 40082, 40083, 40084, 40087, 40092

COMPOSTING
38972

COMPRESSION
38887

COMPUTER PROGRAMS
38909, 38934, 38939, 39021, 39201, 39355, 39363, 39527, 39721, 40008

COMPUTERS
38898, 39171, 39203, 39294, 39305, 39318, 39443, 39461, 39509, 39516, 39521, 39599, 39644, 39667, 39693, 39709, 40109

CONCRETE
39195, 40027

CONDENSATION
38977, 39044, 39066, 39119, 39187, 39404 39475, 39651, 39723

CONDENSATION (ATMOSPHERIC)
38960, 39061, 39463, 39508, 39599, 39615, 39616, 39624, 39625, 39630, 39633, 39635, 39637, 39641, 39648, 39652, 39679, 39684, 39688, 39689, 39703, 39711, 39721, 39723, 39782, 39784, 39974

CONNECTICUT
38931, 40065

CONSTRUCTION MATERIALS
38860, 38916, 38954, 38955, 38979, 39020, 39060, 39063, 39084, 39155, 39195, 39219, 39248, 39280, 39320, 39754, 40012, 40022, 40027, 40042

CONTACT PROCESS
39337

CONTINUOUS MONITORING
39077, 39384, 39392, 39395, 3405, 39425, 39475, 39480, 39482, 39488, 39489, 39492, 39500, 39509, 39518, 39523, 39534, 39563, 39603, 39618, 40038, 40109, 40116, 40134, 40135, 40140

CONTRACTING
40058, 40094

CONTROL AGENCIES
39585, 40040, 40042, 40048, 40101, 40110, 40116, 40117

CONTROL EQUIPMENT-GAS STREAMS
38854, 38857, 38858, 38860, 38871, 38879, 38904, 38908, 38916, 38937, 38943, 38948, 38969, 38972, 38973, 38974, 38975, 38977, 38979, 38981, 38983, 38986, 38987, 38988, 38990, 38991, 38992, 38993, 38999, 39005, 39007, 39008, 39010, 39013, 39016, 39018, 39020, 39021, 39022, 39023, 39026, 39027, 39028, 39031, 39033, 39035, 39037, 39039, 39041, 39043, 39046, 39050, 39053, 39054, 39055, 39056, 39057, 39060, 39067, 39069, 39070, 39074, 39075, 39076, 39077, 39080, 39084, 39092, 39094, 39095, 39096, 39102, 39103, 39104, 39105, 39108, 39109, 39110, 39111, 39113, 39114, 39118, 39119, 39121, 39124, 39130, 39135, 39137, 39138, 39139, 39154, 39164, 39165, 39168, 39169, 39172, 39174, 39178, 39182, 39183, 39185, 39187, 39193, 39204, 39207, 39210, 39211, 39213, 39216, 39220, 39221, 39234, 39236, 39237, 39241, 39243, 39244, 39245, 39246, 39248, 39252, 39253, 39256, 39258, 39259, 39260, 39261, 39262, 39267, 39268, 39273, 39280, 39292, 39295, 39299, 39303, 39307, 39308, 39310, 39312, 39314, 39315, 39320, 39321, 39323, 39325, 39326, 39328, 39329, 39330, 39332, 39334, 39336, 39338, 39339, 39341, 39342, 39343, 39344, 39346, 39347, 39348, 39349, 39351, 39352, 39354, 39356, 39357, 39358, 39359, 39360, 39366, 39367, 39369, 39370, 39374, 39375, 39376, 39377, 39380, 39382, 39393, 39401, 39408, 39413, 39424, 39428, 39431, 39455, 39492, 39494, 39495, 39496, 39531, 39552, 39563, 39604, 39611, 39615, 39627, 39665, 39723, 39777, 39921, 39999, 40000, 40005, 40006, 40008, 40050, 40060, 40076, 40092, 40146

CONTROL PROGRAMS
38898, 38902, 38926, 38939, 38953, 38955, 39014, 39034, 39051, 39093, 39331, 39545, 39550, 39585, 39791, 39808, 40007, 40010, 40011, 40014, 40016, 40034, 40037, 40039, 40040, 40045, 40047, 40050, 40051, 40052, 40054, 40055, 40059, 40060, 40061, 40077, 40081, 40082, 40085, 40086, 40087, 40089, 40092, 40093, 40094, 40097, 40098, 40100, 40110, 40113, 40115, 40116, 40117, 40118, 40120, 40123, 40124, 40125, 40128, 40129, 40132, 40151

CONVECTION
39643, 39781

CONVECTION (ATMOSPHERIC)
39656, 39683, 39689, 39773

COOLING
38871, 38972, 38983, 39020, 39044, 39061, 39082, 39108, 39119, 39120, 39204, 39328, 39336, 39357

COOLING TOWERS
38865, 39025, 39061 39375, 39624, 39625

COPPER
38970, 39078, 39334, 39732, 39736, 39807, 39940, 39989, 40105

COPPER COMPOUNDS
38889, 39045, 39091, 39340, 39390, 39442, 39488, 39580, 39660, 39696, 39727, 39801, 39847, 39919, 40127

CORN
39967

CORONA
39095, 39221

CORROSION
39005, 39031, 39279, 39367, 40139

COSTS
38856, 38857, 38898, 38926, 38928, 38929, 38932, 38937, 38940, 38946, 38953, 38956, 38972, 38973, 38977, 38978, 38992, 39001, 39003, 39011, 39018, 39035, 39043, 39046, 39063, 39065, 39066, 39070, 39079, 39082, 39086, 39094, 39102, 39104, 39108, 39109, 39117, 39123, 39130, 39135, 39138, 39147, 39150, 39153, 39155, 39164, 39176, 39182, 39183, 39185, 39192, 39193, 39194, 39203, 39212, 39213, 39219, 39229, 39243, 39245, 39246, 39248, 39266, 39274, 39300, 39311, 39318, 39328, 39350, 39351, 39354, 39363, 39364, 39367, 39376, 39392, 39449, 39681, 39701, 39752, 40000, 40001, 40002, 40003, 40004, 40005, 40006, 40007, 40008, 40009, 40010, 40011, 40012, 40013, 40014, 40015, 40017, 40018, 40019, 40020, 40021, 40022, 40101, 40109, 40117

COUGH
39823

CRANKCASE EMISSIONS
39130, 39354, 39357

CRANKCASE VENTILATION AIR
39130

CRITERIA
38901, 38973, 39008, 39056, 39107, 39274, 39389, 39423, 39592, 39808, 40022, 40027, 40030, 40034, 40037, 40039, 40049, 40050, 40054, 40108, 40113, 40115

CROP SERVICES
39880, 39883, 39884

CROP SPRAYING
39880, 39883, 39884

CROPS
39582, 39616, 39952, 39954, 39959, 39967, 39968, 39971, 39980, 39990, 39993, 40004

CUPOLAS
38988, 39060, 39124, 39376

CYANATES
38874

CYANIDES
38874, 38904, 38927, 39289, 39412, 39476, 39571, 39772

CYCLIC ALKANES
39961

CZECHOSLOVAKIA
39089, 39418, 39791

D

DATA ANALYSIS
38934, 39103, 39225, 39466, 39617, 39627, 39643, 39667, 39675, 39688, 40008, 40023, 40043, 40116

DATA HANDLING SYSTEMS
38849, 38883, 38899, 38909, 38934, 38939, 39021, 39103, 39201, 39203, 39225, 39355, 39363, 39384, 39395, 39433, 39466, 39524, 39527, 39528, 39531, 39543, 39557 39583, 39585, 39617, 39618, 39627, 39643, 39667, 39674, 39675, 39688, 39721, 40008, 40023, 40040, 40043, 40103, 40109, 40114, 40116, 40128

DECISIONS
40058, 40066, 40075, 40079

DECOMPOSITION
38876, 38890, 38975, 39027, 39048, 39223, 39311, 39332, 39341, 39580, 39735, 39742

DENMARK
38926, 39004, 39244, 39702, 39849

DENSITY
39183, 39479, 39519, 39635

DEPOSITION
38931, 39465, 39624, 39625, 39632, 39647, 39702, 39709, 39715, 39790, 39875, 39891, 39894, 39895, 39954, 39957, 39960

DETERGENT MANUFACTURING
39913, 40006

DIAGNOSIS
39532, 39804, 39809, 39814, 39820, 39847, 39848, 39850, 39853, 39854, 39862, 39873, 39877, 39909, 39928, 39931, 39932, 39938, 39946

DIESEL ENGINES
38888, 38894, 38920, 38931, 38948, 38997, 39030, 39089, 39097, 39121, 39148, 39149, 39214, 39288, 39291, 40098

DIFFRACTION
39414, 39467, 39516

DIFFUSION
38912, 38916, 39183, 39380, 39428, 39429, 39531, 39560, 39575, 39578, 39587, 39614, 39627, 39636, 39664, 39672, 39680, 39682, 39687, 39696, 39697, 39722, 39765, 39777 39779, 39840, 39960, 40036

DIFFUSION (ATMOSPHERIC)
38921, 38967, 39444, 39618, 39619, 39622, 39624, 39625, 39626, 39628, 39632, 39640, 39644, 39649, 39663, 39665, 39666, 39667, 39676, 39693, 39694, 39700, 39701, 39704, 39707, 39708, 39709, 39710, 39712, 39713, 39716, 39717, 39719, 39773, 39992, 40045, 40090, 40117, 40135

DIFFUSION MODELS
38921, 38967, 39444, 39618, 39619, 39622, 39624, 39625, 39626, 39628, 39632, 39640,

39644, 39649, 39663, 39665, 39666, 39667, 39676, 39693, 39694, 39700, 39701, 39704, 39707, 39708, 39709, 39710, 39712, 39713, 39716, 39717, 39719, 39773, 39992, 40045, 40090, 40117, 40135

DIGESTERS
39252

DIGESTIVE SYSTEM
39427, 39816, 39868, 39873, 39909, 39924, 39942, 39946, 39951

DIOLEFINS
39385

DIPHENYLS
40151

DISCOLORATION
39999

DISPERSIONS
39335, 39547

DISSOCIATION
39673

DISTILLATE OILS
38884, 39027, 39092, 39286

DOGS
39836, 39840, 39897

DOMESTIC HEATING
38868, 38914, 38952, 38982, 38996, 39003, 39032, 39084, 39087, 39342, 39597, 39612, 40002, 40010, 40032, 40128, 40140, 40147

DROPLETS
38981, 39044, 39128, 39267, 39358, 39465, 39630, 39635, 39641, 39705, 39721

DRUGS
39840, 39843, 39903, 39940, 39941, 39946, 39947, 39948, 39949

DRYING
39026, 39051, 39054, 39060, 39310, 39332, 39401, 39999

DUMPS
39259

DUST FALL
38860, 38969, 39605, 39696, 39709, 39718, 39954, 40116

DUSTS
38860, 38886, 38916, 38917, 38918, 38945, 38947, 38952, 38958, 38969, 38970, 38972, 38973, 38974, 38983, 38985, 38987, 38988, 38990, 38996, 38998, 39008, 39013, 39018, 39020, 39028, 39033, 39041, 39044, 39056, 39060, 39063, 39074, 39077, 39087, 39092, 39104, 39105, 39113, 39154, 39183, 39210, 39220, 39244, 39245, 39246, 39258, 39263, 39279, 39299, 39308, 39312, 39315, 39327, 39328, 39335, 39342, 39344, 39347, 39349, 39359, 39367, 39369, 39370, 39375, 39376, 39377, 39382, 39387, 39389, 39395, 39397, 39403, 39408, 39412, 39417, 39424, 39433, 39434, 39436, 39442, 39443, 39451, 39457, 39462, 39467, 39476, 39503, 39505, 39516, 39521, 39523, 39525, 39548, 39563, 39564, 39565, 39573, 39585, 39586, 39593, 39594, 39602, 39608, 39610, 39611, 39614, 39621, 39629, 39632, 39634, 39647, 39648, 39709, 39715, 39770, 39790, 39805, 39807, 39816, 39817, 39824, 39831, 39853, 39875, 39882, 39891, 39893, 39894, 39895, 39902, 39904, 39912, 39914, 39920, 39924, 39934, 39962, 40030, 40044

DYNAMOMETERS
38877, 38903, 39015, 40063

E

ECONOMIC LOSSES
39246, 40002, 40003, 40011, 40017, 40113

ECONOMICS
38856, 38857, 38898, 38926, 38928, 38929, 38932, 38937, 38940, 38946, 38953, 38956, 38972, 38973, 38977, 38978, 38992, 39001, 39003, 39011, 39018, 39035, 39043, 39046, 39063, 39065, 39066, 39070, 39079, 39082, 39086, 39094, 39102, 39104, 39108, 39109, 39117, 39123, 39130, 39135, 39138, 39147, 39150, 39153, 39155, 39164, 39176, 39182, 39183, 39185, 39192, 39193, 39194, 39203, 39212, 39213, 39219, 39229, 39243, 39245, 39246, 39248, 39266, 39274, 39300, 39311, 39318, 39328, 39350, 39351, 39354, 39363, 39364, 39367, 39376, 39392, 39449, 39681, 39701, 39752, 40000, 40001, 40002, 40003, 40004, 40005, 40006, 40007, 40008, 40009, 40010, 40011, 40012, 40013, 40014, 40015, 40017, 40018, 40019, 40020, 40021, 40022, 40101, 40109, 40113, 40117

EDUCATION
40106, 40108, 40112, 40113

EFFICIENCY
38857, 38858, 38895, 38904, 38920, 38950, 38971, 38973, 38974, 38981, 38984, 38987, 38988, 38989, 38991, 38994, 38995, 38997, 38999, 39018, 39020, 39021, 39022, 39023, 39024, 39033, 39034, 39035, 39037, 39038, 39040, 39043, 39048, 39052, 39054, 39055, 39057, 39058, 39060, 39062, 39070, 39071, 39074, 39075, 39084, 39086, 39087, 39089, 39094, 39095, 39100, 39102, 39103, 39107, 39126, 39130, 39139, 39140, 39141, 39142, 39148, 39154, 39158, 39165, 39168, 39169, 39180, 39183, 39194, 39200, 39208, 39221, 39222, 39235, 39238, 39245, 39256, 39261, 39263, 39273, 39278, 39284, 39288, 39290, 39299, 39300, 39301, 39302, 39304, 39311, 39320, 39328, 39332, 39334, 39336, 39338, 39341, 39345, 39354, 39356, 39364, 39371, 39376, 39380, 39385, 39387, 39389, 39398, 39399, 39404, 39406, 39407, 39409, 39410, 39411, 39412, 39417, 39418, 39419, 39438, 39454, 39455, 39470, 39471, 39483, 39485, 39486, 39487, 39488, 39490, 39491, 39493, 39498, 39526, 39527, 39535, 39548, 39566, 39611, 39699, 39739, 39741, 39754, 39768, 39776, 39777, 40005, 40006, 40012, 40043

ELECTRIC BATTERIES
38950, 39072, 39097, 39368

ELECTRIC FURNACES
39060, 39074, 39327, 39328, 39866

ELECTRIC POWER GENERATION
38848, 38849, 38851, 38853, 38872, 38882, 38886, 38914, 38918, 38929, 38943, 38946, 38950, 38958, 38962, 38965, 38982, 38993, 38996, 38998, 39003, 39021, 39032, 39036, 39046, 39084, 39087, 39107, 39108, 39110, 39125, 39147, 39150, 39151, 39153, 39154, 39155, 39164, 39167, 39173, 39192, 39193, 39194, 39195, 39218, 39219, 39226, 39227, 39229, 39239, 39255, 39257, 39279, 39283, 39294, 39302, 39318, 39333, 39347, 39364, 39717, 39722, 40000, 40010, 40011, 40012, 40018, 40029, 40034, 40062, 40067, 40070, 40092, 40149

ELECTRIC POWER SOURCES
38950, 39072, 39097, 39099, 39166, 39228, 39300, 39368

ELECTRIC, GAS, AND SANITARY SERVICES
38848, 38849, 38851, 38853, 38854, 38856, 38872, 38875, 38876, 38879, 38880, 38881, 38882, 38886, 38895, 38904, 38911, 38914, 38915, 38917, 38918, 38926, 38927, 38929, 38937, 38943, 38946, 38950, 38954, 38958, 38959, 38962, 38963, 38965, 38972, 38975, 38977, 38982, 38993, 38996, 38998, 39003, 39006, 39010, 39021, 39025, 39032, 39036, 39043, 39046, 39054, 39060, 39066, 39069, 39084, 39087, 39090, 39098, 39107, 39108, 39110, 39125, 39137, 39138, 39147, 39150, 39151, 39153, 39154, 39155, 39157, 39164, 39167, 39173, 39176, 39192, 39193, 39194, 39195, 39207, 39218, 39219, 39226, 39227, 39229, 39239, 39255, 39257, 39259, 39279, 39280, 39283, 39293, 39294, 39302, 39316, 39318, 39333, 39335, 39341, 39347, 39353, 39364, 39367, 39372, 39374, 39412, 39505, 39529, 39606, 39717, 39722, 39749, 39801, 40000, 40010, 40011, 40012, 40018, 40027, 40029, 40034, 40062, 40067, 40070, 40092, 40108, 40113, 40128, 40149

ELECTRICAL AND ELECTRONIC EQUIPMENT PLAN
38930

ELECTRICAL PROPERTIES
38864, 39016, 39018, 39037, 39077, 39095, 39211, 39221, 39228, 39258, 39306, 39321, 39349, 39444, 39477, 39478, 39506, 39508, 39542, 39672, 39677, 39705, 39778, 39933, 39988

ELECTRICAL RESISTANCE
39018, 39077, 39095, 39672, 39705

ELECTRICITY (ATMOSPHERIC)
39541, 39672, 39678

ELECTROCHEMICAL METHODS
39069, 39107, 39393, 39409, 39412, 39424, 39471, 39491, 39498, 39500, 39510, 39511, 39514, 39768, 40096

ELECTROCONDUCTIVITY ANALYZERS
39412, 39424, 39434, 39499, 39513, 39541, 39570, 39678

ELECTROLYSIS
38870, 39182

ELECTRON MICROSCOPY
39414, 39444, 39446, 39459, 39547, 39856

ELECTROSTATIC COUNTERS
39478, 39551

ELECTROSTATIC PRECIPITATORS
38916, 38943, 38969, 38972, 38973, 38977, 38983, 38987, 39005, 39016, 39018, 39020, 39021, 39033, 39060, 39067, 39095, 39104, 39105, 39108, 39139, 39154, 39165, 39183, 39221, 39244, 39245, 39246, 39258, 39303, 39321, 39328, 39334, 39336, 39338, 39339, 39344, 39367, 39375, 39424, 40000, 40006

EMISSION INVENTORIES
38849, 38907, 38934, 38935, 38936, 38952, 40013, 40120

EMISSION STANDARDS
38894, 38920, 38939, 38984, 39042, 39047, 39130, 39131, 39134, 39139, 39152, 39159, 39163, 39216, 39243, 39257, 39271, 39318, 39319, 39331, 39480, 39524, 39550, 39585, 39592, 39757, 39808, 40005, 40007, 40015, 40024, 40025, 40026, 40027, 40028, 40032, 40045, 40048, 40053, 40062, 40067, 40068, 40071, 40072, 40073, 40074, 40075, 40078, 40080, 40081, 40089, 40092, 40093, 40095, 40101, 40104, 40123, 40128, 40130, 40147, 40153

EMPHYSEMA
39802, 39814, 39854, 39860, 39868, 39892, 39907, 39909, 39911, 39923, 39928

EMULSIONS
39335, 39547

ENFORCEMENT PROCEDURES
39585, 39606, 40018, 40057, 40108

ENGINE DESIGN MODIFICATION
38847, 38858, 38909, 38984, 38997, 39000, 39015, 39022, 39047, 39072, 39097, 39123, 39126, 39127, 39130, 39131, 39145, 39148, 39149, 39166, 39170, 39171, 39174, 39177, 39179, 39180, 39188, 39198, 39199, 39200, 39202, 39203, 39206, 39214, 39216, 39217, 39238, 39240, 39247, 39251, 39253, 39254, 39264, 39284, 39285, 39287, 39291, 39296, 39300, 39319, 39355, 39368, 39371, 39758

ENGINE EMISSIONS
38847, 38850, 38852, 38855, 38858, 38861, 38866, 38877, 38887, 38890, 38891, 38893, 38894, 38896, 38897, 38900, 38901, 38902, 38903, 38904, 38906, 38907, 38909, 38911, 38913, 38914, 38920, 38921, 38922, 38923, 38924, 38930, 38931, 38933, 38935, 38937, 38939, 38940, 38941, 38948, 38952, 38961, 38964, 38967, 38980, 38984, 38997, 39000, 39004, 39007, 39009, 39015, 39022, 39026, 39030, 39042, 39047, 39052, 39058, 39065, 39066, 39072, 39078, 39080, 39089, 39097, 39099, 39103, 39114, 39116, 39119, 39121, 39126, 39127, 39130, 39131, 39132, 39143, 39144, 39145, 39148, 39149, 39156, 39159, 39160, 39163, 39170, 39172, 39174, 39177, 39178, 39179, 39180, 39184, 39186, 39188, 39190, 39191, 39196, 39199, 39200, 39202, 39203, 39205, 39213, 39214, 39215, 39216, 39217, 39224, 39236, 39238, 39240, 39242, 39249, 39250, 39251, 39253, 39254, 39261, 39262, 39264, 39265, 39266, 39282, 39284, 39285, 39286, 39287, 39288, 39291, 39295, 39296, 39297, 39298, 39300, 39301, 39306, 39314, 39319, 39324, 39326, 39330, 39340, 39343, 39354, 39355, 39357, 39361, 39366, 39367, 39368, 39371, 39388, 39401, 39406, 39418, 39443, 39476, 39478, 39479, 39484, 39487, 39490, 39492, 39502, 39518, 39549, 39566, 39575, 39576, 39585, 39589, 39591, 39594, 39600, 39603, 39611, 39614, 39617, 39628, 39631, 39645, 39663, 39665, 39673, 39694, 39699, 39700, 39701, 39703, 39712, 39716, 39741, 39761, 39769, 39780, 39786, 39787, 39790, 39801, 39805, 39808, 39813, 39824, 39826, 39829, 39838, 39841, 39846, 39868, 39873, 39895, 39913, 39922, 39960, 39982, 39991, 39992, 40024, 40029, 40040, 40047, 40048, 40060, 40063, 40067, 40071, 40076, 40089, 40098, 40113, 40116, 40123, 40137, 40139, 40144, 40145, 40147, 40149, 40150, 40152

ENGINE OPERATING CYCLES
38847, 38850, 38852, 38855, 38858, 38866, 38877, 38887, 38893, 38894, 38904, 38913, 38940, 38948, 39015, 39030, 39116, 39151, 39160, 39174, 39188, 39215, 39236, 39253, 39295, 39304, 39418, 39566, 39600

ENGINE OPERATION MODIFICATION
38847, 38855, 38870, 38880, 38885, 38887, 38888, 38893, 38948, 39015, 39022, 39030, 39042, 39047, 39058, 39083, 39116, 39127, 39130, 39132, 39133, 39136, 39140, 39143, 39144, 39156, 39159, 39160, 39170, 39172, 39178, 39186, 39188, 39190, 39191, 39202, 39209, 39215, 39216, 39226, 39236, 39249, 39253, 39265, 39266, 39282, 39286, 39287, 39288, 39291, 39297, 39298, 39305, 39324, 39330, 39340, 39354, 39357, 39758, 39760, 39774

ENGINEERS
40102

ENGINES
38850, 38855, 38858, 38877, 38885, 38887, 38888, 38892, 38894, 38901, 38909, 38913, 38920, 38931, 38948, 38950, 38962, 38997, 38998, 39000, 39004, 39009, 39030, 39042, 39047, 39052, 39084, 39089, 39097, 39099, 39103, 39116, 39119, 39121, 39123, 39126, 39127, 39130, 39131, 39132, 39133, 39143, 39144, 39145, 39147, 39148, 39149, 39159, 39160, 39167, 39170, 39171, 39172, 39177, 39179, 39180, 39186, 39188, 39198, 39199, 39202, 39203, 39206, 39214, 39215, 39224, 39229, 39236, 39240, 39247, 39251, 39254, 39262, 39264, 39265, 39276, 39279, 39282, 39284, 39285, 39287, 39288, 39291, 39296, 39298, 39300, 39301, 39305, 39319, 39324, 39326, 39343, 39355, 39357, 39361, 39364, 39366, 39368, 39418, 39756, 39758, 40011, 40098

ENZYMES
39559, 39789, 39822, 39840, 39897, 39912, 39913, 39927, 39930, 39942, 39968, 39975, 39994

EPIDEMIOLOGY
38937, 39583, 39807, 39810, 39811, 39814, 39820, 39833, 39834, 39841, 39845, 39850, 39860, 39861, 39864, 39866, 39868, 39871, 39882, 39890, 39900, 39914, 39926, 39934, 39938, 39941, 39942, 39943, 39944, 39945, 39946, 39947, 39948, 39949, 39951, 40148

EPITHELIUM
39797, 39817, 39821, 39870, 39876, 39925

EQUIPMENT CRITERIA
38973, 39056, 39389, 40030, 40054

EQUIPMENT STANDARDS
39408, 39480, 40043

ESTERS
38862, 39019, 39292, 39571

ETHERS
39765

ETHYLENE
38915, 39289, 39406, 39430, 39515, 39520, 39760

EUROPE
38848, 38850, 38863, 38864, 38868, 38869, 38877, 38879, 38880, 38881, 38882, 38890, 38894, 38896, 38897, 38906, 38912, 38914, 38918, 38926, 38928, 38932, 38938, 38945, 38946, 38947, 38949, 38950, 38952, 38954, 38955, 38957, 38958, 38959, 38962, 38966, 38969, 38970, 38972, 38982, 38983, 38984, 38988, 38990, 38991, 38998, 39003, 39004, 39005, 39009, 39020, 39021, 39032, 39033, 39037, 39039, 39041, 39053, 39055, 39064, 39066, 39067, 39071, 39074, 39076, 39082, 39087, 39088, 39089, 39090, 39092, 39093, 39096, 39099, 39104, 39108, 39109, 39112, 39113, 39114, 39115, 39122, 39128, 39140, 39146, 39148, 39149, 39151, 39153, 39154, 39160, 39165, 39167, 39170, 39172, 39176, 39179, 39187, 39200, 39202, 39204, 39205, 39206, 39217, 39224, 39230, 39231, 39232, 39233, 39237, 39238, 39239, 39244, 39245, 39246, 39247, 39252, 39253, 39258, 39262, 39263, 39265, 39276, 39282, 39291, 39292, 39295, 39299, 39300, 39301, 39302, 39305, 39312, 39315, 39321, 39326, 39328, 39329, 39335, 39337, 39338, 39339, 39342, 39343, 39344, 39346, 39347, 39349, 39350, 39351, 39352, 39356, 39358, 39359, 39360, 39361, 39362, 39364, 39365, 39367, 39369, 39370, 39371, 39373, 39374, 39375, 39376, 39377, 39379, 39380, 39382, 39383, 39384, 39387, 39389, 39391, 39392, 39395, 39400, 39403, 39404, 39405, 39407, 39413, 39418, 39421, 39422, 39424, 39429, 39432, 39433, 39436, 39438, 39440, 39442, 39446, 39450, 39451, 39456, 39457, 39459, 39463, 39465, 39467, 39474, 39477, 39479, 39482, 39502, 39503, 39505, 39506, 39507, 39508, 39509, 39510, 39511, 39512, 39513, 39514, 39515, 39516, 39517, 39518, 39519, 39520, 39521, 39522, 39523, 39525, 39526, 39536, 39537, 39544, 39548, 39554, 39555, 39556, 39557, 39558, 39561, 39562, 39563, 39565, 39567, 39568, 39569, 39571, 39574, 39577, 39593, 39599, 39608, 39609, 39610, 39612, 39615, 39618, 39619, 39621, 39629, 39637, 39641, 39642, 39645, 39646, 39663, 39664, 39676, 39687, 39692, 39693, 39702, 39707, 39709, 39710, 39713, 39714, 39719, 39720, 39721, 39723, 39724, 39731, 39735, 39737, 39740, 39755, 39758, 39759, 39760, 39761, 39765, 39767, 39771, 39776, 39782, 39783, 39788, 39791, 39792, 39793, 39799, 39816, 39817, 39830, 39836, 39837, 39839, 39843, 39845, 39846, 39847, 39849, 39863, 39871, 39878, 39879, 39880, 39882, 39883, 39884, 39886, 39887, 39888, 39890, 39891, 39898, 39902, 39903, 39911, 39915, 39919, 39920, 39932, 39933, 39934, 39935, 39936, 39937, 39939, 39953, 39954, 39957, 39958, 39961, 39962, 39974, 39982, 39984, 39986, 39989, 39993, 40001, 40002, 40013, 40019, 40024, 40030, 40031, 40033, 40036, 40038, 40040, 40043, 40085, 40098, 40099, 40104, 40105, 40106, 40128, 40133, 40134, 40135, 40138, 40140, 40141, 40142, 40144, 40147, 40148

EVAPORATORS
39108, 39252

EXCESS AIR
38873, 38915, 38959, 38966, 38971, 38996, 39136, 39151, 39204, 39209, 39239, 39271, 39286, 39288, 39290, 39761

EXCRETIONS
39791, 39792, 39801, 39807, 39812, 39819, 39823, 39824, 39826, 39828, 39829, 39865, 39866, 39867, 39876, 39885, 39899, 39906, 39916, 39939, 39944, 39947, 39951

EXHAUST SYSTEMS
38993, 39008, 39026, 39077, 39121, 39234, 39241, 39273, 39307, 39328, 39358, 39374, 39375

EXPERIMENTAL EQUIPMENT
39454, 39475, 39538, 39850, 39991

EXPERIMENTAL METHODS
39406, 39411, 39491, 39532, 39736, 39778, 39850, 39991, 39997

EXPLOSIONS
39090, 39174, 39506, 39517, 39571

EXPOSURE METHODS
39790, 39816, 39821, 39830, 39838, 39842, 39844, 39852, 39869, 39889, 39924, 39925, 39956, 39968, 39973, 39980, 39987, 39990

EXTERNAL COMBUSTION ENGINES
38892, 38948, 38950, 39097, 39126, 39145, 39147, 39177, 39199, 39229, 39247, 39285, 39296, 39300, 39319, 39368

EYE IRRITATION
39786, 39828, 39835, 39858, 39893

EYES
39823

F

FABRIC FILTERS
38860, 38943, 38969, 38974, 38979, 39018, 39023, 39041, 39060, 39074, 39111, 39139, 39328, 39334, 39336, 39346, 39563

FALLOUT
39633

FANS (BLOWERS)
39234, 39273, 39374

FARMS
38985, 39278, 39759, 39824, 39977, 39980

FEASIBILITY STUDIES
38931, 39046, 39319, 39426

FEEDLOTS
38985, 39969

FERROALLOYS
39246, 39261

FIELD TESTS
39411, 39419, 39442, 39490, 39535, 39541, 39544, 39570, 39712

FILTER FABRICS
38979, 38990, 39026, 39028, 39031, 39074, 39104, 39299, 39328, 39336, 39338, 39380, 39382, 39393, 39408, 39428, 39431, 39494, 39496, 39611, 40006

FILTERS
38860, 38943, 38969, 38972, 38974, 38977, 38979, 38990, 38991, 39010, 39018, 39020, 39023, 39026, 39028, 39031, 39037, 39041, 39060, 39074, 39092, 39104, 39111, 39113, 39114, 39118, 39121, 39139, 39246, 39258, 39260, 39295, 39299, 39328, 39334, 39336, 39338, 39346, 39358, 39359, 39380, 39382, 39393, 39408, 39413, 39428, 39431, 39492, 39494, 39496, 39531, 39563, 39604, 39611, 39627, 40006

FINLAND
38926, 39687, 39891

FIRING METHODS
38853, 38857, 38859, 38871, 38873, 38884, 38885, 38908, 38915, 38926, 38928, 38959, 38962, 38966, 38971, 38996, 39004, 39009, 39020, 39050, 39058, 39062, 39069, 39071, 39073, 39090, 39099, 39107, 39116, 39127, 39128, 39129, 39136, 39137, 39140, 39147, 39151, 39153, 39156, 39158, 39167, 39184, 39188, 39192, 39193, 39194, 39201, 39204, 39208, 39209, 39222, 39227, 39239, 39252, 39271, 39279, 39281, 39283, 39286, 39288, 39289, 39290, 39293, 39304, 39305, 39316, 39340, 39342, 39360, 39458, 39761, 39774

FLAME AFTERBURNERS
38854, 38857, 39076, 39108, 39130, 39165, 39236, 39330, 39341, 39351, 39375, 40006

FLAME IONIZATION DETECTOR (CO)
39386, 39400, 39401, 39410, 39411, 39412, 39418, 39421, 39424, 39425, 39433, 39441, 39458, 39480, 39481, 39485, 39487, 39504, 39507, 39509, 39529, 39566, 40096

FLORIDA
39527

FLOWERS
39952, 39955, 39956, 39971, 39980, 39998

FLOWMETERS
39564

FLUID FLOW
38899, 38964, 38991, 39033, 39038, 39057, 39067, 39077, 39092, 39336, 39387, 39444, 39564, 39632, 39635, 39666, 39685, 39693, 39725, 39745, 39758, 39765, 39779, 39781, 40012

FLUORESCENCE
39388, 39414, 39424, 39450, 39452, 39516, 39519, 39881

FLUORIDES
39157, 39400, 39476, 39491, 39551, 39555, 39573, 39899, 39957, 39968, 39972, 40137

FLUORINE
39023, 39310, 39968

FLUORINE COMPOUNDS
38848, 38958, 39023, 39157, 39400, 39476, 39491, 39551, 39555, 39573, 39634, 39791, 39867, 39899, 39957, 39968, 39972, 39983, 40137

FLUOROSIS
39899

FLY ASH
38848, 38880, 38981, 39139, 39155, 39195, 39219, 39259, 39267, 39280, 39288, 39335, 39347, 39403, 39452, 40018, 40034

FOG
38960, 39061, 39463, 39508, 39615, 39624, 39625, 39679, 39721, 39723, 39974

FOOD AND KINDRED PRODUCTS INDUSTRY
38975, 39039, 39278, 39341, 39485, 39900, 40006

FORESTS
38925, 39432, 39608, 39883, 39997

FORMALDEHYDES
38867, 39094, 39289, 39341, 39961, 40096

FORMIC ACID
39325

FRACTIONATION
39537

FRANCE
38896, 38926, 38928, 38932, 38954, 38955, 38959, 38962, 38991, 39112, 39128, 39146, 39257, 39305, 39342, 39350, 39351, 39352, 39370, 39380, 39384, 39387, 39389, 39391, 39395, 39404, 39407, 39421, 39429, 39446, 39474, 39526, 39555, 39556, 39557, 39558, 39567, 39618, 39619, 39621, 39719, 39720, 39740, 39793, 39845, 39878, 39879, 39880, 39883, 39884, 39933, 39957, 40019, 40036, 40038, 40128, 40133, 40134, 40135

FREE RADICALS
39673, 39735, 39760, 39766, 39803

FROTH FLOATATION
39002, 39352, 39372

FRUITS
39980, 39981

FUEL ADDITIVES
38855, 38930, 39089, 39240, 39243, 39250, 39288, 39555, 39800, 39801, 39808, 39824, 40001, 40017, 40057, 40069, 40122, 40131, 40144

FUEL CELLS
38950, 39097, 39368

FUEL CHARACTERISTICS
38848, 38882, 38938, 38968, 39002, 39011, 39141, 39142, 39255, 39275, 40034, 40062

FUEL CHARGING
38971, 39009, 39127, 39128, 39151, 39156, 39184, 39188, 39304, 39342

FUEL CRITERIA
40034

FUEL EVAPORATION
38903, 38907, 38935, 38937, 39007, 39066, 39114, 39213, 39354, 39357, 40060, 40063, 40076

FUEL GASES
38853, 38859, 38865, 38868, 38872, 38884, 38928, 38958, 38966, 38971, 38978, 38995, 38996, 38998, 39001, 39020, 39029, 39085, 39098, 39106, 39122, 39136, 39153, 39185, 39188, 39215, 39222, 39227, 39281, 39288, 39290, 39304, 39331, 39348, 39356, 39379, 39384, 39506, 39529, 40028

FUEL OIL PREPARATION
38928, 39024, 39027, 39035, 39086, 39140, 39150, 39158, 39192, 39193, 39225, 39229

FUEL OILS
38853, 38859, 38865, 38884, 38943, 38958, 38971, 38996, 39007, 39020, 39023, 39024, 39027, 39029, 39085, 39092, 39151, 39153, 39185, 39208, 39209, 39222, 39226, 39227, 39239, 39283, 39286, 39288, 39290, 39476, 39492, 39529, 39597, 39604, 39768, 40008, 40083, 40084, 40092, 40147

FUEL RESOURCES
38861, 38884, 38898, 38938, 40062, 40066

FUEL STANDARDS
[illegible], 40017, 40051, 40057, 40065, 40066, [illegible], 40083, 40084, 40090, 40131, 40134

FUEL TANK EVAPORATION
39007, 39066, 39357

FUEL TREATMENT
38882, 38884, 38918, 38926, 38928, 38998, 39002, 39024, 39027, 39035, 39036, 39040, 39081, 39082, 39086, 39125, 39140, 39141, 39142, 39150, 39158, 39161, 39162, 39173, 39192, 39193, 39212, 39225, 39229, 39235, 39248, 39257, 39272, 39275, 39318, 39350, 39352, 39356, 39372, 39597, 39733, 40005, 40019, 40147

FUMES
38897, 39059, 39220, 39307, 39907, 39913

FUNGI
39972, 39975, 40138

FURNACES
38848, 38853, 38857, 38865, 38868, 38870, 38874, 38904, 38917, 38960, 38970, 38983, 38988, 38996, 39023, 39024, 39027, 39031, 39036, 39055, 39060, 39071, 39073, 39074, 39084, 39085, 39088, 39096, 39108, 39124, 39125, 39128, 39129, 39136, 39137, 39140, 39141, 39142, 39147, 39150, 39151, 39153, 39158, 39162, 39164, 39167, 39173, 39185, 39192, 39194, 39201, 39208, 39209, 39212, 39222, 39225, 39229, 39235, 39241, 39246, 39255, 39257, 39263, 39272, 39275, 39279, 39288, 39290, 39293, 39302, 39304, 39327, 39328, 39334, 39335, 39350, 39367, 39375, 39376, 39377, 39492, 39505, 39866, 40012, 40028, 40032

G

GAMMA RADIATION
39186, 39443, 39460

GAS CHROMATOGRAPHY
39006, 39213, 39381, 39386, 39396, 39400, 39401, 39402, 39410, 39411, 39412, 39418, 39421, 39424, 39425, 39433, 39441, 39447, 39458, 39462, 39480, 39481, 39485, 39487, 39504, 39507, 39509, 39529, 39554, 39559, 39566, 40096

GAS SAMPLING
38927, 39380, 39402, 39424, 39434, 39457, 39473, 39486, 39492, 39493, 39506, 39524, 39561, 39604

GAS TURBINE ENGINES
38885, 38892, 38901, 38909, 38913, 38948, 38950, 38962, 38998, 39000, 39042, 39047, 39097, 39099, 39123, 39127, 39147, 39167, 39171, 39179, 39180, 39188, 39198, 39202, 39203, 39229, 39240, 39264, 39276, 39279, 39284, 39287, 39288, 39300, 39301, 39355, 39364, 39368, 39756, 39758

GASIFICATION
38882, 38884, 38918, 38998, 39027, 39035, 39036, 39040, 39081, 39082, 39125, 39140, 39141, 39142, 39150, 39158, 39162, 39173, 39192, 39193, 39212, 39225, 39229, 39235, 39248, 39257, 39272, 39275, 39350, 39733

GASOLINES
38855, 38911, 38920, 38930, 38948, 38996, 39009, 39065, 39089, 39121, 39130, 39213, 39243, 39288, 39300, 39476, 39487, 39739, 39761, 39808, 39846, 39873, 40001, 40017, 40050, 40057, 40069, 40076, 40122, 40131, 40144

GENETICS
39854, 39881, 39929

GERMANY, FEDERAL REPUBLIC
38848, 38850, 38863, 38868, 38869, 38877, 38879, 38880, 38882, 38894, 38914, 38918, 38926, 38952, 38958, 38970, 38972, 38982, 38988, 38990, 38998, 39003, 39005, 39009, 39020, 39021, 39032, 39033, 39037, 39064, 39066, 39071, 39074, 39087, 39088, 39090, 39092, 39096, 39104, 39108, 39109, 39115, 39154, 39160, 39165, 39170, 39172, 39176, 39179, 39187, 39200, 39204, 39239, 39245, 39246, 39262, 39263, 39265, 39292, 39299, 39329, 39339, 39343, 39346, 39349, 39356, 39359, 39360, 39361, 39362, 39367, 39373, 39374, 39375, 39376, 39377, 39382, 39400, 39403, 39432, 39433, 39436, 39438, 39442, 39457, 39482, 39502, 39503, 39505, 39506, 39507, 39508, 39509, 39510, 39511, 39512, 39513, 39514, 39515, 39516, 39517, 39518, 39519, 39520, 39521, 39522, 39523, 39537, 39561, 39563, 39565, 39569, 39571, 39593, 39599, 39612, 39645, 39737, 39760, 39761, 39765, 39816, 39839, 39843, 39847, 39871, 39888, 39898, 39903, 39915, 39934, 39935, 39936, 39937, 39958, 39982, 39986, 40024, 40030, 40040, 40043, 40099, 40104, 40144

GLANDS
39848, 39870, 39871, 39924, 39944

GLASS
39005, 39023, 39092, 39314, 39403, 39428

GLASS FABRICS
38979, 39026, 39382, 39393, 39408, 39428, 39431, 39494, 39496, 39611

GRAIN PROCESSING
40006

GRANTS
40058

GRAPHITE
39228, 39413, 39428, 39642, 39756

GRASSES
40004

GRAVITY COLLECTORS
39060, 39124, 39210, 39260, 39352, 39358, 39369

GRAVITY SETTLING (CONTROL)
39183, 39352, 39372, 39632

GREAT BRITAIN
38881, 38897, 38906, 38926, 38938, 38946, 38950, 38957, 39041, 39099, 39114, 39140, 39148, 39149, 39153, 39167, 39202, 39205, 39224, 39230, 39231, 39232, 39233, 39237, 39276, 39282, 39291, 39295, 39300, 39301, 39302, 39364, 39379, 39383, 39422, 39450, 39459, 39463, 39465, 39467, 39544, 39574, 39577, 39637, 39731, 39755, 39767, 39788, 39792, 39799, 39846, 39953, 39954, 39962, 40001, 40098, 40106, 40138, 40140, 40141, 40142, 40148

GREENHOUSES
39980, 39998

GROUND LEVEL
38852, 38982, 39061, 39465, 39472, 39587, 39593, 39599, 39613, 39622, 39629, 39631, 39632, 39638, 39639, 39640, 39644, 39645, 39659, 39674, 39675, 39693, 39710, 39713, 39717, 40040, 40090

GUINEA PIGS
39819, 39836, 39837, 39911

H

HALOGEN GASES
38870, 38889, 38993, 39012, 39023, 39154, 39182, 39270, 39278, 39289, 39310, 39435, 39476, 39511, 39512, 39513, 39518, 39967, 39968, 39992, 40144

HALOGENATED HYDROCARBONS
38881, 38910, 38912, 38957, 39157, 39270, 39381, 39515, 39520, 39559, 39577, 39706, 39851, 39896, 39901, 40151

HAMSTERS
39836, 39873, 39912

HARBORS
40096

HAWAII
40074, 40117

HAZE
39782

HEALTH IMPAIRMENT
38874, 38908, 39572, 39590, 39787, 39788, 39793, 39798, 39808, 39810, 39812, 39814, 39816, 39819, 39820, 39822, 39828, 39830, 39835, 39837, 39846, 39848, 39855, 39858, 39859, 39861, 39865, 39866, 39871, 39872, 39876, 39893, 39897, 39913, 39925, 39930, 39934, 40002, 40003, 40028, 40029, 40149

HEALTH STATISTICS
39791, 39806, 39834, 39868

HEARINGS
40092

HEART
39904, 39942

HEAT OF COMBUSTION
39098

HEAT TRANSFER
38871, 38971, 38972, 38983, 38993, 39020, 39026, 39044, 39061, 39064, 39082, 39087, 39108, 39119, 39120, 39125, 39147, 39150, 39153, 39167, 39200, 39204, 39205, 39208, 39222, 39238, 39255, 39328, 39329, 39336, 39357, 39643, 39675, 39761, 39772, 39777, 39781, 40152

HEAVY-DUTY VEHICLES
38903, 39249, 39280, 39297, 39319, 39462, 39872

HEIGHT FINDING
39621, 39664, 39707, 39713, 39717

HEMATOLOGY
39549, 39787, 39788, 39789, 39791, 39792, 39795, 39801, 39810, 39811, 39812, 39818, 39822, 39824, 39826, 39829, 39831, 39836, 39838, 39844, 39848, 39854, 39858, 39862, 39865, 39866, 39869, 39871, 39877, 39924, 39934, 39935, 39942, 39944, 39946, 39947, 39948, 39992, 39994

HEMOGLOBIN
39789, 39812, 39818, 39826, 39871, 39992

HERBICIDES
39973

HEXANES
39515, 39701, 39780, 39961

HI-VOL SAMPLERS
39431, 39483, 39494, 39496, 39497, 39570

HIGHWAYS
38917, 38921, 38931, 38939, 38941, 38961, 39462, 39549, 39580, 39594, 39603, 39622, 39701, 39712, 39790, 39801, 39922, 39960, 39991, 39992, 40047, 40115

HISTAMINES
39887

HOUSTON
38907

HUMIDITY
38867, 38985, 39061, 39211, 39239, 39310, 39336, 39346, 39484, 39521, 39564, 39579, 39583, 39590, 39629, 39630, 39642, 39652, 39662, 39675, 39685, 39697, 39704, 39834, 39924, 39990, 40096, 40130

HYDRAZINES
39353

HYDRIDES
39175

HYDROCHLORIC ACID
38879, 38881, 38927, 38959, 39182, 39289, 39412, 39476, 39512, 39513, 39514, 39772, 39940, 40042

HYDROCYANIC ACID
38874, 39105, 39115

HYDRODESULFURIZATION
39027

HYDROFLUORIC ACID
38908, 39118, 39289, 39310, 39476, 39512, 39514, 39772

HYDROGEN
38896, 38909, 38976, 38980, 39025, 39055, 39079, 39112, 39117, 39132, 39175, 39182, 39353, 39412, 39418, 39422, 39506, 39646, 39663, 39677, 39690, 39734, 39741, 39764, 39786

HYDROGEN SULFIDE
38875, 38908, 38932, 38975, 38976, 38978, 38998, 39006, 39007, 39012, 39027, 39054, 39055, 39081, 39105, 39115, 39122, 39142, 39146, 39154, 39187, 39232, 39233, 39235, 39272, 39289, 39290, 39292, 39310, 39313, 39341, 39356, 39362, 39365, 39373, 39383, 39384, 39394, 39421, 39435, 39494, 39501, 39511, 39512, 39513, 39521, 39592, 39611, 39726, 39743, 39765, 39775, 39986

HYDROGENATION
38976, 39024, 39740

HYDROLYSIS
39571

HYDROSPHERE
38889, 39573, 39672, 39696, 39718

HYDROXIDES
38896, 38975, 39157, 39256, 39313, 39766, 39772, 39786

HYGROMETERS
39675

HYGROSCOPICITY
39313, 39711

HYPERSENSITIVITY
39853, 39854, 39857, 39929

HYPOXIA
39799, 39877

I

ICE
39635, 39637, 39703, 39711

IDAHO
40082

ILLINOIS
38889, 38907, 39422, 39657, 40007, 40056, 40095, 40100

IMMUNOLOGY
39844, 39847, 39853, 39854, 39886, 39889, 39905, 39923, 39929, 39930

IMPINGEMENT
39551

INCINERATORS (REFUSE)
38854, 38856, 38879, 38880, 38881, 38895, 38904, 38911, 38915, 38917, 38927, 38954, 38972, 38977, 38996, 39003, 39010, 39025, 39032, 39043, 39060, 39066, 39069, 39090, 39098, 39108, 39137, 39157, 39293, 39316, 39341, 39367, 39412, 39505, 39529, 40012, 40067, 40128

INCINERATORS (WASTE GASES)
38854, 38857, 38858, 38904, 38948, 38983, 38999, 39022, [illegible], 39057, 39076, 39080, 39094, 39096, 39103, 39108, 39109, 39130, 39154, 39165, 39172, 39174, 39178, 39204, 39216, 39236, 39243, 39252, 39253, 39261, 39262, 39314, 39326, 39330, 39341, 39343, 39351, 39354, 39357, 39360, 39366, 39375, 39665, 40006

INDIANA
39469, 40056, 40095

INDOOR
38897, 38941, 39026, 39408, 39611, 39615, 39805, 39825, 39827, 39828, 39829, 39831, 40044, 40143, 40146

INDUSTRIAL AREAS
38860, 38865, 38945, 38952, 38960, 38969, 38982, 39384, 39432, 39586, 39592, 39596, 39601, 39613, 39618, 39685, 39693, 39709, 39710, 39711, 39713, 39791, 39807, 39812, 39833, 39841, 39866, 39867, 39938, 39939, 39953, 39962, 39964, 39974, 40036, 40037, 40094, 40128, 40134

INERTIAL SEPARATION
39183, 39408, 39632

INFECTIOUS DISEASES
39799, 39844, 39854, 39857, 39889, 39893, 39907, 39930

INFRARED RADIATION
39426, 39734

INFRARED SPECTROMETRY
38910, 39385, 39412, 39424, 39433, 39447, 39449, 39480, 39485, 39500, 39515, 39520, 39529, 39566, 39603, 39730, 39768

INGESTION
39788, 39792, 39800, 39805, 39824, 39831, 39867, 39881, 39892, 39899

INHIBITION
39844, 39897, 39933, 39958, 39968, 39988

INORGANIC ACIDS
38851, 38879, 38881, 38908, 38927, 38959, 38983, 38993, 39006, 39049, 39070, 39076, 39084, 39109, 39118, 39182, 39218, 39220, 39268, 39289, 39294, 39310, 39332, 39337, 39338, 39378, 39404, 39412, 39428, 39474, 39476, 39512, 39513, 39514, 39570, 39571, 39619, 39630, 39755, 39772, 39782, 39783, 39940, 39961, 40028, 40032, 40042

INSPECTION
39060, 39086, 39130, 40147

INSPECTORS
40044

INSTRUMENTATION
38899, 38937, 39069, 39380, 39381, 39392, 39394, 39407, 39414, 39416, 39418, 39420, 39439, 39440, 39441, 39447, 39448, 39452, 39454, 39455, 39461, 39466, 39470, 39472, 39474, 39475, 39480, 39488, 39492, 39493, 39494, 39505, 39506, 39507, 39508, 39509, 39510, 39511, 39512, 39513, 39514, 39515, 39516, 39517, 39518, 39519, 39520, 39521, 39523, 39524, 39525, 39527, 39529, 39532, 39533, 39535, 39538, 39552, 39561, 39635, 39666, 39675, 39699, 39881, 40043

INTERNAL COMBUSTION ENGINES
38850, 38855, 38858, 38877, 38887, 38888, 38892, 38894, 38920, 38931, 38948, 38950, 38997, 39004, 39009, 39030, 39042, 39052, 39084, 39089, 39097, 39099, 39103, 39116, 39119, 39121, 39130, 39131, 39132, 39133, 39143, 39144, 39148, 39149, 39159, 39160, 39170, 39172, 39186, 39206, 39214, 39215, 39224, 39236, 39251, 39254, 39262, 39265, 39282, 39288, 39291, 39298, 39300, 39305, 39324, 39326, 39343, 39357, 39361, 39366, 39418, 40011, 40098

INTESTINES
39816, 39951

INVERSION
38982, 39301, 39522, 39605, 39623, 39631, 39637, 39691, 39871

IODIDES
39157

IODINATED HYDROCARBONS
39270

IODINE
39270

IODINE COMPOUNDS
39157, 39703, 39755

IONIZATION
39245, 39541, 39723, 40145

IONS
39006, 39270, 39341, 39393, 39595, 39615, 39672, 39677, 39682, 39690, 39698, 39723, 39742, 39933

IRELAND
38926

IRON
38954, 38955, 38979, 38988, 39073, 39074, 39327, 39328, 39340, 39377, 39378, 39451, 39529, 39710, 39736, 40006, 40020

IRON COMPOUNDS
39045, 39322, 39580, 39602, 39696, 39742, 39876, 39915, 40127

IRON OXIDES
38983, 39698, 39742

IRRADIATION CHAMBERS
39038, 39751, 39786, 40096

ISOTOPES
39646, 39649, 39734

ITALY
38926, 39479, 39615, 39721, 39723, 39758

J

JAPAN
38847, 38852, 38853, 38857, 38858, 38860, 38862, 38865, 38867, 38870, 38871, 38872, 38873, 38874, 38875, 38876, 38884, 38893, 38904, 38905, 38910, 38919, 38926, 38927, 38973, 38974, 38975, 38987, 38993, 38994, 38996, 39006, 39007, 39008, 39012, 39013, 39014, 39015, 39016, 39017, 39018, 39019, 39022, 39023, 39024, 39025, 39027, 39029, 39030, 39031, 39034, 39035, 39038, 39044, 39045, 39048, 39049, 39050, 39051, 39052, 39054, 39056, 39057, 39058, 39059, 39060, 39073, 39077, 39083, 39084, 39085, 39086, 39094, 39100, 39101, 39102, 39103, 39105, 39107, 39111, 39116, 39119, 39120, 39121, 39158, 39169, 39174, 39178, 39182, 39183, 39185, 39186, 39197, 39209, 39210, 39220, 39221, 39222, 39223, 39226, 39227, 39234, 39261, 39270, 39271, 39277, 39278, 39286, 39288, 39289, 39303, 39304, 39306, 39308, 39310, 39313, 39314, 39317, 39332, 39336, 39340, 39341, 39348, 39390, 39397, 39401, 39402, 39408, 39409, 39410, 39411, 39412, 39415, 39417, 39434, 39435, 39443, 39444, 39449, 39455, 39458, 39470, 39473, 39475, 39476, 39481, 39483, 39485, 39486, 39487, 39489, 39490, 39491, 39493, 39496, 39497, 39499, 39501, 39535, 39541, 39553, 39564, 39566, 39570, 39575, 39576, 39580, 39582, 39583, 39584, 39585, 39586, 39588, 39589, 39590, 39591, 39592, 39594, 39595, 39596, 39597, 39598, 39600, 39601, 39602, 39603, 39604, 39605, 39607, 39611, 39623, 39627, 39631, 39632, 39636, 39640, 39672, 39677, 39678, 39680, 39682, 39685, 39686, 39695, 39705, 39726, 39738, 39739, 39741, 39744, 39746, 39749, 39752, 39754, 39766, 39768, 39769, 39773, 39774, 39797, 39798, 39802, 39810, 39811, 39812, 39820, 39822, 39823, 39825, 39826, 39827, 39828, 39829, 39832, 39833, 39834, 39842, 39854, 39855, 39856, 39857, 39858, 39859, 39860, 39862, 39864, 39865, 39866, 39867, 39868, 39870, 39874, 39875, 39876, 39877, 39901, 39904, 39906, 39914, 39924, 39925, 39926, 39938, 39940, 39942, 39943, 39944, 39945, 39946, 39947, 39948, 39949, 39950, 39951, 39952, 39955, 39956, 39959, 39963, 39964, 39966, 39967, 39971, 39975, 39976, 39977, 39978, 39979, 39981, 39983, 39985, 39987, 39990, 39994, 39999, 40003, 40028, 40029, 40032, 40037, 40039, 40042, 40045, 40093, 40094, 40096, 40101, 40107, 40112, 40116, 40139, 40145, 40149, 40150, 40151

JET AIRCRAFT
38852, 38896, 38933, 39042, 39079, 39156, 39188, 39253, 39301, 39443, 39465, 39474, 39478, 39479, 39628, 39631, 39665, 39673, 39757

K

KANAGAWA PREFECTURE
39576, 39580, 39623, 39820, 40094, 40116

KANSAS
39697

KEROSENE
38871, 39767

KETONES
38862, 39019, 39122

KIDNEYS
39819, 39848, 39873, 39909, 39924, 39951, 39994

KILNS
38916, 39020, 39084, 39100, 39104, 39110, 39140, 39225, 39246, 40005, 40006, 40092

KRAFT (SULFATE) PULPING
38932, 38954, 38955, 38956, 38975, 39043, 39055, 39252, 39341, 39592, 40067

L

LABORATORY ANIMALS
38930, 39795, 39938

LABORATORY FACILITIES
39637, 39758

LACQUERS
39109

LAKES
39647, 39696

LAND USE PLANNING
38856, 38861, 38905, 38931, 38941, 39105, 39572, 39697, 40007, 40033, 40047, 40100, 40113, 40118, 40119, 40120, 40121, 40125, 40126, 40130, 40132, 40150

LANDFILLS
38880, 39207, 39259

LARYNX
39855, 39874

LASERS
39388, 39399, 39406, 39430, 39440, 39468, 39519, 39522, 39538

LATIN AMERICA
39861, 40111

LAUNDERING (COAL)
38989, 39011, 39352

LEAD
38951, 38969, 40105

LEAD COMPOUNDS
38850, 38855, 38877, 38880, 38887, 38889, 38930, 38931, 38944, 38952, 38961, 38969, 39012, 39089, 39243, 39295, 39306, 39330, 39413, 39427, 39476, 39488, 39516, 39526, 39531, 39549, 39551, 39555, 39580, 39591, 39602, 39603, 39611, 39614, 39660, 39696, 39699, 39701, 39703, 39712, 39716, 39724, 39727, 39739, 39780, 39787, 39788, 39789, 39790, 39792, 39795, 39796, 39801, 39805, 39808, 39812, 39813, 39824, 39826, 39829, 39831, 39846, 39848, 39849, 39856, 39865, 39866, 39881, 39885, 39895, 39897, 39922, 39937, 39939, 39958, 39960, 39982, 39988, 39991, 39992, 39994, 40001, 40017, 40037, 40057, 40069, 40122, 40127, 40131, 40144

LEAVES
39443, 39491, 39957, 39958, 39960, 39962, 39971, 39974, 39976, 39977, 39978, 39979, 39980, 39982, 39985, 39991, 39995

LEGISLATION
38892, 38912, 38926, 38932, 39078, 39148, 39408, 39606, 39808, 40015, 40018, 40035, 40041, 40044, 40046, 40058, 40068, 40070, 40072, 40074, 40075, 40080, 40088, 40092, 40095, 40097, 40098, 40099, 40100, 40101, 40104, 40108, 40111, 40113, 40124, 40126, 40127, 40141, 40153

LEUKEMIA
40148

LIDAR
39448, 39468, 39522, 39540

LIGHT SCATTERING
39399, 39436, 39464, 39479, 39503, 39519, 39539, 39540, 39547, 39721, 39772

LIGHT-DUTY VEHICLES
38852, 38858, 38887, 38893, 38902, 38920, 38930, 38939, 38980, 38996, 39065, 39072, 39078, 39149, 39163, 39166, 39181, 39190, 39196, 39216, 39247, 39250, 39251, 39254, 39266, 39296, 39298, 39314, 39330, 39353, 39462, 39576, 39590, 39591, 39594, 39614, 39787, 39805, 39824, 40104, 40108

LIME KILNS
39100, 39104, 39110, 39140, 39225, 40005, 40006, 40092

LIMESTONE
38916, 38955, 39045, 39046, 39100, 39125, 39141, 39142, 39164, 39197, 39208, 39223, 39235, 39255, 39302, 39351, 39403, 40008, 40092

LINE SOURCES
39622, 39640, 39691, 39712

LIPIDS
39403, 39912, 39927

LITHIUM COMPOUNDS
39228, 39670, 39689

LITIGATION
40077

LIVER
39427, 39873, 39909, 39924, 39942, 39946, 39951

LOCAL GOVERNMENTS
39423, 40130, 40153

LOFTING
39691

LONDON
38897, 39422, 39544

LOS ANGELES
38849, 38935, 39166, 39469, 39598, 39622, 39631, 39644, 39737, 39806, 40130

LOWER ATMOSPHERE
38890, 38900, 39617, 39631, 39640, 39643, 39650, 39672, 39681, 39684, 39685, 39698, 39725

LUNG CANCER
39806, 39816, 39855, 39868, 39875, 39902, 39909

LUNG CLEARANCE
39891, 39893

LUNGS
39503, 39797, 39803, 39804, 39809, 39816, 39817, 39821, 39840, 39842, 39844, 39852, 39855, 39856, 39859, 39874, 39876, 39891, 39893, 39905, 39909, 39911, 39923, 39924, 39925, 39927, 39932

LYMPHOCYTES
39925

M

MAGNESIUM
39731

MAGNESIUM COMPOUNDS
39070, 39075, 39311, 39660, 39698, 39726

MAGNETIC PROPERTIES
39306

MAGNETIC SEPARATION
39352

MAGNETOHYDRODYNAMICS (MHD)
38950

MAINTENANCE
38868, 38872, 38897, 38973, 39016, 39018, 39041, 39056, 39060, 39077, 39086, 39104, 39110, 39121, 39130, 39176, 39291, 39323, 39344, 39359, 39521, 40000, 40008, 40147

MANAGEMENT PERSONNEL
40085

MANGANESE COMPOUNDS
39091, 39240, 39317, 39488, 39551, 39579, 39580, 39602, 39660, 39698, 39742, 39800, 39801, 39844, 39918, 39919

MANGANESE DIOXIDE PROCESS
39351

MANUFACTURING INDUSTRIES
38854, 38862, 38865, 38908, 38930, 38932, 38936, 38937, 38947, 38949, 38951, 38954, 38955, 38956, 38969, 38970, 38975, 38988, 38993, 38994, 38996, 39024, 39039, 39043, 39055, 39060, 39084, 39093, 39134, 39172, 39187, 39234, 39252, 39278, 39327, 39341, 39485, 39491, 39529, 39579, 39592, 39596, 39600, 39693, 39733, 39738, 39742, 39761, 39791, 39837, 39866, 39867, 39898, 39900, 39913, 39939, 39940, 39989, 40006, 40012, 40027, 40028, 40067, 40105, 40149

MAPPING
39572

MASS SPECTROMETRY
39410, 39445, 39447, 39542

MASS TRANSPORTATION
38939, 39353

MASSACHUSETTS
40034, 40062, 40067, 40070, 40083, 40084

MATHEMATICAL ANALYSES
38866, 38867, 38869, 38888, 38896, 38898, 38909, 38921, 38939, 38961, 38963, 38995, 39033, 39058, 39067, 39068, 39088, 39103, 39197, 39202, 39245, 39275, 39287, 39294, 39299, 39302, 39318, 39344, 39355, 39388, 39417, 39426, 39429, 39436, 39444, 39451, 39453, 39478, 39479, 39484, 39535, 39536, 39574, 39617, 39622, 39627, 39629, 39630, 39633, 39638, 39641, 39658, 39659, 39666, 39687, 39691, 39694, 39695, 39707, 39715, 39716, 39721, 39724, 39725, 39729, 39737, 39745, 39748, 39751, 39756, 39759, 39761, 39763, 39766, 39771, 39773, 39777, 39779, 39781, 39784, 39786, 39818, 39820, 39869, 39885, 39991, 39992, 40004, 40008, 40010, 40012, 40013, 40014, 40016, 40023, 40038, 40090, 40091, 40120, 40126, 40132, 40143, 40146

MATHEMATICAL MODELING
38866, 38867, 38869, 38888, 38896, 38898, 38909, 38921, 38939, 38961, 38963, 39067, 39103, 39202, 39275, 39294, 39302, 39318, 39355, 39617, 39627, 39633, 39691, 39715, 39725, 39737, 39745, 39748, 39771, 39773, 39784, 39786, 39885, 39992, 40004, 40008, 40010, 40012, 40014, 40016, 40023, 40038, 40091, 40120, 40126, 40132, 40143, 40146

MAXIMUM ALLOWABLE CONCENTRATION
38904, 39530, 39585, 39793, 39830, 39836, 39921, 40029, 40031, 40033, 40045

MBTH METHOD (ALDEHYDES)
40096

MEETINGS
39173

MEMBRANE FILTRATION
39383, 39390, 39408, 39424, 39428, 39446, 39459, 39473, 39551, 39586

MEMBRANES
39803, 39837, 39893, 39925, 39992

MERCAPTANS
38875, 38932, 38975, 39006, 39007, 39054, 39256, 39341, 39365, 39501, 39592

MERCURY COMPOUNDS
38943, 38944, 38999, 39051, 39182, 39289, 39334, 39358, 39394, 39401, 39404, 39442, 39450, 39488, 39494, 39516, 39524, 39551, 39554, 39573, 39586, 39696, 39773, 39881, 39888, 39894, 39906, 39993, 39998, 40053, 40113, 40127, 40151

METABOLISM
39788, 39839, 39881, 39887, 39938, 39939, 39973, 39992

METAL COMPOUNDS
38850, 38851, 38855, 38877, 38880, 38887, 38889, 38930, 38931, 38943, 38944, 38947, 38951, 38952, 38961, 38967, 38969, 38999, 39002, 39012, 39027, 39031, 39045, 39051, 39070, 39075, 39089, 39091, 39100, 39118, 39157, 39169, 39182, 39197, 39208, 39223, 39228, 39231, 39235, 39240, 39243, 39259, 39264, 39289, 39290, 39295, 39306, 39311, 39317, 39322, 39330, 39334, 39340, 39358, 39390, 39394, 39400, 39401, 39404, 39413, 39417, 39427, 39432, 39442, 39450, 39452, 39473, 39476, 39488, 39494, 39496, 39516, 39524, 39526, 39531, 39546, 39549, 39551, 39554, 39555, 39573, 39579, 39580, 39586, 39591, 39602, 39603, 39611, 39614, 39624, 39625, 39634, 39650, 39660, 39670, 39689, 39696, 39698, 39699, 39701, 39703, 39712, 39716, 39718, 39724, 39726, 39727, 39732, 39739, 39742, 39773, 39776, 39780, 39787, 39788, 39789, 39790, 39792, 39795, 39796, 39800, 39801, 39805, 39808, 39812, 39813, 39816, 39824, 39826, 39829, 39831, 39839, 39843, 39844, 39846, 39847, 39848, 39849, 39856, 39863, 39865, 39866, 39876, 39881, 39885, 39886, 39888, 39891, 39892, 39894, 39895, 39897, 39898, 39903, 39905, 39906, 39908, 39909, 39911, 39915, 39916, 39918, 39919, 39920, 39921, 39922, 39937, 39938, 39939, 39957, 39958, 39960, 39961, 39965, 39982, 39988, 39991, 39992, 39993, 39994, 39998, 40001, 40017, 40037, 40053, 40057, 40069, 40092, 40108, 40113, 40116, 40122, 40127, 40131, 40144, 40145, 40151

METAL FABRICATION
38865, 38947, 38951, 38954, 38955, 38969, 38970, 38988, 38994, 39060, 39093, 39529, 39738, 39791, 39866, 39867, 39898, 39939, 39940, 39989, 40006, 40027, 40105

METAL INDUSTRIES
38954, 38988, 39060, 39234, 39327, 39742, 40012

METAL POISONING
39787, 39790, 39813, 39824, 39849, 39863, 39864, 39865, 39866, 39881, 39898, 39906, 39926, 39938, 39939, 39941, 39942, 39943, 39944, 39945, 39946, 39947, 39948, 39949, 39950, 39951

METALS
38947, 38951, 38954, 38955, 38969, 38970, 38979, 38988, 39026, 39039, 39073, 39074, 39078, 39080, 39246, 39261, 39327, 39328, 39334, 39340, 39377, 39378, 39451, 39460, 39529, 39710, 39731, 39732, 39736, 39741, 39791, 39807, 39867, 39898, 39940, 39989, 40006, 40020, 40105

METEOROLOGICAL INSTRUMENTS
39461, 39472, 39643, 39668, 39674, 39675

METEOROLOGY
38860, 38867, 38889, 38891, 38899, 38900, 38924, 38931, 38933, 38960, 38961, 38964, 38967, 38985, 39061, 39211, 39239, 39310, 39336, 39345, 39346, 39384, 39395, 39444, 39461, 39463, 39465, 39472, 39484, 39508, 39521, 39531, 39536, 39545, 39564, 39572, 39579, 39582, 39583, 39587, 39590, 39591, 39596, 39599, 39601, 39605, 39607, 39609, 39610, 39613, 39615, 39616, 39617, 39619, 39620, 39623, 39624, 39625, 39626, 39627, 39629, 39630, 39633, 39635, 39637, 39638, 39639, 39640, 39641, 39642, 39643, 39644, 39647, 39648, 39651, 39652, 39653, 39654, 39655, 39656, 39657, 39658, 39659, 39660, 39661, 39662, 39666, 39667, 39668, 39669, 39670, 39671, 39674, 39675, 39676, 39677, 39678, 39679, 39680, 39683, 39684, 39685, 39686, 39688, 39689, 39690, 39691, 39693, 39695, 39696, 39697, 39699, 39700, 39701, 39702, 39703, 39704, 39705, 39707, 39708, 39710, 39711, 39712, 39714, 39715, 39716, 39718, 39719, 39720, 39721, 39722, 39723, 39724, 39725, 39727, 39759, 39773, 39782, 39784, 39834, 39884, 39900, 39904, 39917, 39924, 39957, 39974, 39978, 39990, 40024, 40038, 40040, 40090, 40096, 40109, 40110, 40116, 40124, 40130, 40145, 40149

METHANES
38854, 38875, 38890, 38925, 39201, 39421, 39447, 39474, 39493, 39501, 39504, 39509, 39515, 39517, 39520, 39592, 39646, 39834, 40096

METROPOLITAN AREAS
38861, 38889, 38890, 38905, 38906, 38931, 38941, 38942, 38959, 39166, 39176, 39342, 39381, 39395, 39419, 39433, 39442, 39461, 39472, 39527, 39570, 39581, 39583, 39584, 39585, 39587, 39588, 39589, 39594, 39595, 39603, 39605, 39607, 39609, 39614, 39615, 39617, 39643, 39651, 39652, 39653, 39654, 39656, 39657, 39658, 39660, 39667, 39668, 39669, 39670, 39671, 39674, 39683, 39684, 39686, 39688, 39689, 39690, 39691, 39697, 39700, 39714, 39718, 39723, 39724, 39783, 39801, 39802, 39806, 39810, 39811, 39824, 39825, 39826, 39827, 39828, 39829, 39831, 39845, 39871, 39882, 39899, 39904, 39913, 39917, 39923, 39932, 39963, 39966, 39994, 40007, 40028, 40045, 40047, 40109, 40110, 40116, 40118, 40120, 40123, 40124, 40129, 40139, 40145, 40147

MEXICO
39861, 40111

MICE
39830, 39832, 39836, 39837, 39842, 39843, 39844, 39851, 39852, 39870, 39876, 39922

MICHIGAN
40056, 40095, 40113

MICROMETEOROLOGY
38933, 39617, 39676, 39688, 39719

MICROORGANISMS
38890, 38945, 39386, 39564, 39775, 39844, 39853, 39889, 39893, 39972, 39975, 40138

MICROSCOPY
39414, 39438

MIDDLE ATMOSPHERE
38933, 39388, 39426, 39587, 39646, 39649, 39650, 39663, 39673, 39694, 39698, 39704, 39762, 39764

MILK
38969, 39864, 39926, 39943, 39944, 39945, 39946, 39947, 39948, 39949, 39950, 39951

MINERAL PROCESSING
38860, 38916, 38936, 38951, 38954, 38955, 38979, 39023, 39060, 39063, 39320, 39322, 39451, 39491, 40012, 40022, 40027

MINING
38937, 39467, 40152

MINNESOTA
40056, 40095

MISSILE AND SPACECRAFT LAUNCH VEHICLES
38964, 39426

MISSOURI
39461, 39472, 39587, 39613, 39643, 39651, 39652, 39653, 39654, 39656, 39657, 39660, 39662, 39668, 39669, 39670, 39671, 39674, 39683, 39684, 39688, 39689, 39690, 39697

MISTS
38857, 38910, 39182, 39288, 39313, 39337, 39338, 39895, 39924

MOBILE EMISSION SOURCES
38852, 38858, 38861, 38872, 38887, 38890, 38891, 38893, 38894, 38896, 38897, 38900, 38901, 38902, 38903, 38904, 38906, 38907, 38911, 38913, 38914, 38917, 38920, 38921, 38922, 38923, 38924, 38930, 38931, 38933, 38939, 38940, 38941, 38952, 38961, 38964, 38967, 38980, 38996, 39042, 39047, 39065, 39072, 39078, 39079, 39099, 39114, 39127, 39149, 39156, 39163, 39166, 39175, 39181, 39188, 39189, 39190, 39196, 39207, 39216, 39237, 39240, 39247, 39249, 39250, 39251, 39253, 39254, 39266, 39276, 39280, 39286, 39296, 39297, 39298, 39301, 39314, 39319, 39330, 39347, 39353, 39355, 39388, 39426, 39443, 39462, 39465, 39474, 39478, 39479, 39484, 39541, 39575, 39576, 39589, 39590, 39591, 39594, 39606, 39614, 39617, 39628, 39631, 39645, 39661, 39663, 39665, 39673, 39685, 39694, 39700, 39712, 39757, 39787, 39801, 39805, 39813, 39824, 39826, 39829, 39838, 39846, 39850, 39868, 39872, 39895, 39960, 39992, 40002, 40024, 40029, 40040, 40047, 40048, 40050, 40052, 40060, 40063, 40067, 40071, 40089, 40098, 40104, 40108, 40113, 40115, 40116, 40118, 40119, 40125, 40126, 40139, 40144, 40145, 40147, 40149, 40150, 40152, 40153

MOLYBDENUM COMPOUNDS
39727

MONITORING
38899, 38904, 38927, 38937, 39069, 39077, 39165, 39305, 39384, 39388, 39392, 39395, 39398, 39405, 39406, 39416, 39425, 39426, 39430, 39433, 39437, 39439, 39441, 39445, 39447, 39448, 39454, 39461, 39466, 39468, 39472, 39475, 39480, 39482, 39488, 39489, 39492, 39500, 39502, 39509, 39510, 39511, 39517, 39518, 39519, 39521, 39522, 39523, 39524, 39527, 39528, 39529, 39531, 39533, 39534, 39536, 39538, 39539, 39540, 39543, 39545, 39546, 39548, 39550, 39556, 39557, 39558, 39561, 39563, 39564, 39578, 39585, 39603, 39610, 39617, 39618, 39626, 39661, 39674, 39675, 39681, 39697, 39921, 40030, 40036, 40038, 40040, 40043, 40044, 40062, 40065, 40096, 40109, 40114, 40116, 40117, 40134, 40135, 40140, 40150, 40152

MONTHLY
39583, 39584, 39585, 39598, 39607, 39610, 39653, 39977, 40116

MORBIDITY
39583, 39793, 39798, 39799, 39807, 39810, 39816, 39823, 39833, 39841, 39854, 39860, 39871, 39882, 39888, 39914, 39938, 39947, 40021

MORTALITY
39583, 39793, 39802, 39806, 39807, 39844, 39868, 39871, 39875, 39882, 39902, 39904, 39923

MOTTLING
39985

MOUNTAINS
39635, 39865

MULTIPLE CHAMBER INCINERATORS
39367

N

NAPHTHALENES
39105

NATIONAL GOVERNMENTS
40058, 40079, 40097, 40101, 40112, 40125, 40128, 40130, 40153

NATURAL EMISSION SOURCES
39649

NATURAL GAS
38853, 38872, 38978, 38996, 39020, 39085, 39136, 39281, 39384, 39506, 39529

NAUSEA
39892

NECROSIS
39876, 39955, 39957, 39974, 39977, 39979

NERVOUS SYSTEM
39787, 39788, 39802, 39828, 39832, 39848, 39929

NETHERLANDS
38890, 38926, 39082, 39122, 39392, 39405, 39451, 39477, 39702, 39771

NEUTRAL CONDITION
39691

NEUTRON ACTIVATION ANALYSIS
38889, 39419, 39424, 39442, 39443, 39460, 39531, 39554, 39573, 39881

NEVADA
40075

NEW HAMPSHIRE
40051

NEW JERSEY
40060, 40130, 40132

NEW YORK CITY
38940, 38941, 39469, 40108, 40123, 40124

NEW YORK STATE
38940, 38941, 39469, 39527, 40108, 40123, 40124

NICKEL
39246, 39898

NICKEL COMPOUNDS
39264, 39340, 39488, 39551, 39847, 39888, 39898, 39905, 39918, 39965, 40127

NICOTINES
39804, 39840

NITRATES
39059, 39471, 39498, 39571, 39577, 39579, 39647, 39735, 39858, 39859, 39956, 39959, 39982, 40096

NITRIC ACID
38993, 39049, 39076, 39084, 39474, 39571, 39630, 39755, 40028, 40032

NITRIC ANHYDRIDE (N2O5)
39084, 39490

NITRIC OXIDE (NO)
38887, 38888, 38896, 38913, 38933, 38952, 38971, 38994, 39012, 39015, 39062, 39080, 39083, 39084, 39128, 39156, 39158, 39184, 39201, 39202, 39239, 39261, 39283, 39288, 39290, 39310, 39317, 39355, 39388, 39406, 39424, 39434, 39437, 39447, 39466, 39474, 39482, 39490, 39494, 39495, 39500, 39511, 39515, 39520, 39555, 39580, 39598, 39603, 39607, 39645, 39646, 39673, 39678, 39734, 39736, 39741, 39744, 39754, 39758, 39760, 39766, 39772, 39774, 39834, 39859, 39967, 39980, 40096, 40150

NITRILES
38874, 38878

NITRITES
39059, 39571, 39834

NITROGEN
38859, 38896, 38971, 38993, 39093, 39227, 39226, 39422, 39464, 39646, 39647, 39663, 39673, 39751, 39764

NITROGEN DIOXIDE (NO2)
38859, 38887, 38994, 39012, 39059, 39062, 39065, 39076, 39084, 39239, 39271, 39309, 39310, 39317, 39388, 39399, 39424, 39435, 39437, 39447, 39466, 39474, 39476, 39489, 39490, 39495, 39500, 39511, 39512, 39518, 39521, 39550, 39555, 39580, 39598, 39603, 39604, 39607, 39611, 39645, 39678, 39697, 39735, 39737, 39748, 39751, 39754, 39766, 39819, 39834, 39842, 39844, 39857, 39858, 39859, 39889, 39905, 39934, 39952, 39967, 39980, 39986, 39987, 40028, 40029, 40077, 40089, 40096, 40124, 40150

NITROGEN ORGANIC COMPOUNDS
38875, 38975, 39115, 39270, 39341, 39415, 39471, 39493, 39501, 39569, 39765, 39804, 39840, 39969, 39973, 39999

NITROGEN OXIDES
38847, 38849, 38852, 38853, 38858, 38859, 38866, 38868, 38871, 38872, 38873, 38883, 38885, 38887, 38888, 38893, 38894, 38896, 38899, 38901, 38903, 38907, 38908, 38909, 38911, 38913, 38920, 38925, 38926, 38927, 38928, 38929, 38931, 38933, 38935, 38939, 38940, 38947, 38952, 38953, 38958, 38959, 38960, 38966, 38967, 38971, 38980, 38984, 38994, 38996, 38997, 39006, 39009, 39012, 39013, 39015, 39022, 39023, 39024, 39029, 39038, 39042, 39047, 39048, 39049, 39050, 39051, 39059, 39062, 39065, 39068, 39076, 39080, 39083, 39084, 39085, 39099, 39107, 39126, 39127, 39128, 39130, 39131, 39132, 39144, 39145, 39148, 39149, 39151, 39154, 39156, 39158, 39163, 39170, 39178, 39179, 39184, 39185, 39188, 39190, 39191, 39199, 39200, 39201, 39202, 39203, 39205, 39208, 39209, 39215, 39216, 39217, 39222, 39226, 39227, 39236, 39238, 39239, 39249, 39250, 39251, 39253, 39254, 39257, 39261, 39265, 39271, 39281, 39282, 39283, 39286, 39287, 39288, 39290, 39296, 39297, 39298, 39302, 39304, 39309, 39310, 39317, 39319, 39331, 39333, 39340, 39354, 39355, 39357, 39361, 39374, 39388, 39394, 39395, 39399, 39404, 39406, 39408, 39412, 39416, 39424, 39433, 39434, 39435, 39437, 39439, 39447, 39449, 39466, 39471, 39474, 39476, 39482, 39484, 39489, 39490, 39494, 39495, 39500, 39511, 39512, 39515, 39518, 39520, 39521, 39524, 39534, 39550, 39555, 39575, 39579, 39580, 39583, 39584, 39585, 39589, 39590, 39598, 39603, 39604, 39605, 39606, 39607, 39611, 39645, 39646, 39661, 39663, 39665, 39673, 39677, 39678, 39686, 39697, 39730, 39731, 39734, 39735, 39736, 39737, 39741, 39744, 39748, 39751, 39754, 39758, 39760, 39766, 39769, 39771, 39772, 39774, 39783, 39803, 39808, 39819, 39834, 39842, 39844, 39846, 39857, 39858, 39859, 39889, 39893, 39905, 39923, 39934, 39952, 39961, 39967, 39980, 39986, 39987, 39999, 40002, 40003, 40018, 40024, 40028, 40029, 40032, 40037, 40048, 40071, 40077, 40089, 40096, 40108, 40116, 40123, 40124, 40149, 40150

NITROUS ANHYDRIDE (N2O3)
39084

NITROUS OXIDE (N2O)
39084, 39555, 39730, 39731

NON-METROPOLITAN AREAS
38889, 38891, 38922, 38924, 38985, 39278, 39527, 39608, 39615, 39652, 39714, 39723, 39759, 39801, 39824, 39826, 39831, 39833, 39845, 39865, 39871, 39962, 39977, 39980, 40128, 40145

NORWAY
38926, 39593, 39642, 39663, 39702

NOSE
39823

NUCLEAR POWER
39129, 39147

NUCLEAR POWER PLANTS
38886, 38946, 38993, 39318, 39722

NUCLEATION
39260, 39404, 39475, 39553, 39630, 39637, 39641, 39642, 39650, 39651, 39652, 39672, 39685, 39697, 39698, 39701, 39703, 39705, 39711, 39723, 39740, 39784

NUCLEIC ACIDS
39809

NYLON
38979

O

OCEANS
38861, 38890, 39541, 39573, 39577, 39578, 39648, 39672, 39679, 39682, 39685, 39695, 39705, 39722, 39727, 39977, 39979

OCTANES
38887, 39243

ODOR CONTROL
38972, 38975, 38977, 38993, 39006, 39010, 39017, 39039, 39054, 39069, 39094, 39176, 39221, 39256, 39277, 39278, 39303, 39341

ODOR COUNTERACTION
38972, 38975, 38977, 38993, 39006, 39010, 39017, 39039, 39054, 39069, 39094, 39176, 39221, 39256, 39277, 39278, 39303, 39341

ODORIMETRY
39341, 39470, 39481, 39501

ODOROUS POLLUTANTS
38854, 38875, 38876, 38901, 38932, 38975, 38993, 39006, 39024, 39051, 39069, 39176, 39220, 39221, 39252, 39277, 39278, 39303, 39341, 39423, 39470, 39485, 39486, 39493, 39501, 39555, 39577, 39584, 39592, 39913, 40037, 40130, 40137, 40139, 40151

OHIO
38851, 39419, 40077, 40081

OIL BURNERS
38868

OLEFINS
38871, 38915, 39289, 39385, 39401, 39406, 39430, 39515, 39520, 39753, 39760

OPEN BURNING
38917, 38925, 39785, 40113

OPEN HEARTH FURNACES
40012

OPERATING CRITERIA
38901, 39008, 39107, 39808, 40022, 40027, 40030, 40050

OPERATING VARIABLES
38847, 38848, 38854, 38871, 38873, 38885, 38911, 38913, 38958, 38973, 38988, 39008, 39025, 39030, 39046, 39049, 39050, 39073, 39095, 39103, 39129, 39136, 39140, 39141, 39142, 39153, 39167, 39170, 39179, 39180, 39192, 39193, 39194, 39199, 39225, 39245, 39255, 39263, 39290, 39299, 39302, 39357,

39402, 39412, 39441, 39455, 39486, 39726, 39739, 39750, 39767, 40019, 40030

OPINION SURVEYS
39585, 40103, 40121, 40139, 40140, 40141

OPTICAL METHODS
39414, 39438

ORGANIC ACIDS
38874, 38878, 38945, 39094, 39105, 39115, 39292, 39325, 39341, 39424, 39843, 39939, 39982, 39987

ORGANIC DISEASES
39848

ORGANIC WASTES
38915, 39054, 39801

ORGANOMETALLICS
39551, 39555

OSAKA
38852, 38875, 39570, 39584, 39586, 39590, 39600, 39636, 39686, 39826, 39827, 39828, 39834, 39904, 39925, 40096, 40139

OVERFIRE AIR
39283

OXIDANTS
38874, 39394, 39476, 39512, 39524, 39555, 39575, 39579, 39582, 39583, 39584, 39585, 39598, 39605, 39606, 39616, 39623, 39631, 39661, 39686, 39769, 39786, 39803, 39834, 39835, 39858, 39859, 39889, 39893, 39913, 39923, 39959, 39970, 39977, 39978, 39979, 39983, 40003, 40037, 40077, 40096, 40116, 40123, 40149, 40150

OXIDATION
38857, 38890, 38909, 38913, 38975, 38976, 38993, 38998, 39007, 39076, 39159, 39161, 39163, 39169, 39182, 39223, 39224, 39303, 39341, 39342, 39432, 39579, 39645, 39650, 39732, 39733, 39756, 39767, 39776, 39782, 39803, 39809

OXYGEN
38859, 38868, 38896, 38899, 38960, 38983, 38993, 39231, 39286, 39418, 39464, 39645, 39663, 39673, 39731, 39734, 39737, 39740, 39742, 39746, 39760, 39764, 39840, 39877, 39933

OXYGEN CONSUMPTION
39975

OXYGEN DIFFUSION
39840, 39877

OZONE
38875, 38933, 38947, 38975, 39303, 39388, 39395, 39405, 39430, 39433, 39437, 39447, 39474, 39490, 39524, 39555, 39580, 39590, 39616, 39638, 39645, 39646, 39661, 39663, 39665, 39673, 39734, 39737, 39748, 39778, 39783, 39809, 39821, 39822, 39857, 39858, 39859, 39876, 39889, 39893, 39952, 39959, 39967, 39972, 39973, 39975, 39982, 39985, 39995, 40096, 40143, 40146

P

PACKED TOWERS
39102, 39182, 39341

PAINTS
38857, 38862, 39787, 39824, 39998, 39999

PAINTS AND ALLIED PRODUCTION
38862, 38930, 38949, 38993, 40006

PAPER
39157, 39313

PAPER AND ALLIED MANUFACTURING
38932, 38954, 38955, 38956, 38975, 39043, 39055, 39252, 39341, 39592, 40067

PAPER MILLS
38932, 38954, 38956

PARTICLE COUNTING
39404, 39408, 39444, 39459, 39475, 39478, 39535, 39547, 39551, 39553, 40044

PARTICLE GROWTH
38998, 39183, 39246, 39630, 39635, 39637, 39641, 39698, 39711, 39740, 39784

PARTICLE INVESTIGATION METHODS
39383, 39390, 39397, 39404, 39408, 39422, 39424, 39428, 39438, 39444, 39446, 39459, 39468, 39473, 39475, 39478, 39497, 39535, 39547, 39551, 39553, 39586, 39648, 39658, 39695, 39699, 39723, 40044

PARTICLE SEPARATION
39383, 39390, 39408, 39424, 39428, 39446, 39459, 39473, 39551, 39586

PARTICLE SHAPE
38855, 39397, 39446, 39632, 39635

PARTICLE SIZE
38855, 38860, 38889, 38972, 38989, 38991, 39012, 39018, 39060, 39077, 39100, 39139, 39183, 39223, 39240, 39246, 39260, 39330, 39336, 39338, 39345, 39346, 39352, 39397, 39403, 39404, 39408, 39422, 39436, 39444, 39451, 39455, 39459, 39463, 39497, 39503, 39535, 39541, 39548, 39552, 39553, 39556, 39562, 39574, 39587, 39615, 39625, 39630, 39632, 39635, 39642, 39652, 39660, 39672, 39682, 39685, 39695, 39699, 39711, 39721, 39744, 39750, 39777, 39859, 39940, 40138, 40144

PARTICULATE CLASSIFICATION METHODS
39429, 39519

PARTICULATE SAMPLING
38927, 39077, 39139, 39424, 39434, 39436, 39457, 39462, 39488, 39496, 39505, 39523, 39526, 39551, 39556, 39587, 39611, 39685, 39695, 40044

PATHOLOGICAL TECHNIQUES
39800, 39801, 39802, 39819, 39822, 39842, 39873, 39876, 39907, 39911, 39932, 39941

PENNSYLVANIA
39639, 40060, 40066, 40076, 40086

PERFORMANCE STANDARDS
38894, 38920, 38939, 38984, 39042, 39047, 39130, 39131, 39134, 39139, 39152, 39159, 39163, 39216, 39243, 39257, 39271, 39318, 39319, 39331, 39480, 39524, 39550, 39585, 39592, 39757, 39808, 40005, 40007, 40015, 40024, 40025, 40026, 40027, 40028, 40032, 40045, 40048, 40053, 40062, 40067, 40068, 40071, 40072, 40073, 40074, 40075, 40078, 40080, 40081, 40089, 40092, 40093, 40095, 40101, 40104, 40123, 40128, 40130, 40147, 40153

PERMEABILITY
39299, 39795

PERMITS
40105

PEROXIDES
39859

PEROXYACETYL NITRATE
39577, 39858, 39859, 40096

PEROXYACYL NITRATES
39577, 39858, 39859, 39956, 39559, 40096

PERSONNEL
38865, 39825, 39826, 39827, 39828, 39829, 39835, 40044, 40085, 40102, 40106

PERSONNEL QUALIFICATIONS
40102, 40106

PERYLENES
39600

PESTICIDES
38864, 38876, 38957, 39382, 39527, 39555, 39559, 39759, 39878, 39879, 39880, 39883, 39884, 39897, 39981

PETER SPENCE PROCESS (CLAUS)
38976, 39232, 39233

PETROLEUM AND COAL PRODUCTS INDUSTRY
38937, 38954, 38996, 39024, 39084, 39134, 39172, 39341, 39529, 39579, 39596, 39600, 39693, 39733, 39761, 40027, 40028, 40149

PETROLEUM DISTRIBUTION
38937, 39213, 40149

PETROLEUM PRODUCTION
38937

PETROLEUM REFINING
38937, 38954, 38996, 39024, 39084, 39134, 39172, 39341, 39529, 39579, 39596, 39600, 39693, 39733, 39761, 40027, 40028, 40149

PETUNIA
39956

PH
39055, 39670, 39677, 39690, 39720, 39999

PHENOLS
38975, 39289, 39391, 39494, 39830

PHENYL COMPOUNDS
38957, 39385, 39402, 40151

PHENYLS
39385, 39402

PHILADELPHIA
40060, 40066

PHOSPHORIC ACID
39109

PHOSPHOROUS ORGANIC COMPOUNDS
39471

PHOSPHORUS COMPOUNDS
38936, 39400, 39647, 39905

PHOTOCHEMICAL REACTIONS
38862, 38937, 38960, 39441, 39577, 39630, 39631, 39645, 39646, 39650, 39661, 39663, 39686, 39698, 39737, 39746, 39751, 39762, 39764, 39769, 39775, 39783, 39786, 39835, 39858, 39859, 40145

PHOTOELECTRIC PHENOMENA
39505, 39512, 39747

PHOTOGRAPHIC METHODS
39444, 39463, 39479, 39624, 39697, 39722, 39997

PHOTOLYSIS
39645, 39646, 39737, 39751, 39783

PHOTOMETRIC METHODS
39383, 39386, 39403, 39407, 39421, 39424, 39425, 39433, 39448, 39474, 39479, 39485, 39505, 39518, 39525, 39534, 39547, 39565, 39648

PHOTOOXIDATION
39630, 39645, 39737, 39783

PHOTOSYNTHESIS
39952, 39958, 39961, 39967, 39968, 39981, 39985, 39990, 39992

PHYTOTOXICANTS
39973, 39981

PILOT PLANTS
39013, 39141, 39147, 39225, 39229, 39275, 39290, 39293, 39302, 39332, 39348, 39529, 39776

PINTO BEANS
39996

PLANNING AND ZONING
38856, 38861, 38905, 38931, 38941, 39105, 39434, 39572, 39697, 40007, 40033, 40038, 40039, 40045, 40047, 40100, 40104, 40113, 40118, 40119, 40120, 40121, 40125, 40126, 40128, 40130, 40132, 40133, 40134, 40150

PLANT DAMAGE
38908, 38937, 39582, 39608, 39616, 39697, 39708, 39876, 39952, 39955, 39956, 39957, 39959, 39962, 39964, 39967, 39969, 39970, 39971, 39972, 39973, 39974, 39976, 39977, 39978, 39979, 39980, 39981, 39982, 39983, 39985, 39987, 39989, 39990, 39995, 39996, 39997, 39998, 40002, 40003, 40113, 40139

PLANT GROWTH AND DEVELOPMENT
39616, 39952, 39955, 39958, 39959, 39961, 39962, 39967, 39968, 39971, 39972, 39973, 39974, 39977, 39980, 39981, 39985, 39986, 39988, 39990, 39992, 39996

PLANT INDICATORS
39697, 39952, 39955, 39959, 39963, 39964, 39966, 39971, 39983

PLASTICS
38881, 38979, 39157, 39237, 39428, 39486

PLATINUM
39039

PLETHYSMOGRAPHY
39862

PLUME BEHAVIOR
39061, 39468, 39519, 39624, 39625, 39628, 39640, 39643, 39664, 39665, 39666, 39684, 39691, 39694, 39697, 39722

PNEUMOCONIOSIS
39853, 39887, 39892

PNEUMONIA
39816

POINT SOURCES
38849, 38883, 39619, 39628, 39639, 39664, 40007, 40117, 40121

POLYMERIZATION
38949

POLYNUCLEAR COMPOUNDS
38966, 39105, 39537, 39600, 39612, 39740, 39797, 39806, 39840, 39852, 39875, 39902

POTASSIUM COMPOUNDS
39027, 39045, 39100, 39317, 39698, 39847, 39888

POTENTIOMETRIC METHODS
39107, 39393, 39424, 39491, 39500, 39510, 39511, 39514, 39768, 40096

POULTRY
39901, 39993

POWER CYCLES
39257

POWER SOURCES
38850, 38855, 38858, 38861, 38877, 38885, 38887, 38888, 38892, 38894, 38901, 38909, 38913, 38920, 38931, 38948, 38950, 38962, 38984, 38997, 38998, 39000, 39004, 39009, 39030, 39042, 39047, 39052, 39072, 39084, 39089, 39097, 39099, 39103, 39116, 39119, 39121, 39123, 39126, 39127, 39129, 39130, 39131, 39132, 39133, 39143, 39144, 39145, 39147, 39148, 39149, 39159, 39160, 39166, 39167, 39170, 39171, 39172, 39177, 39179, 39180, 39186, 39188, 39198, 39199, 39200, 39202, 39203, 39206, 39214, 39215, 39217, 39224, 39228, 39229, 39236, 39238, 39240, 39247, 39251, 39254, 39257, 39262, 39264, 39265, 39276, 39279, 39282, 39284, 39285, 39287, 39288, 39291, 39296, 39298, 39300, 39301, 39305, 39319, 39324, 39326, 39343, 39353, 39355, 39357, 39361, 39364, 39366, 39368, 39371, 39418, 39756, 39758, 39808, 40011, 40098

PRECIPITATION
38985, 39345, 39444, 39461, 39472, 39591, 39596, 39601, 39605, 39609, 39610, 39633, 39635, 39637, 39642, 39647, 39651, 39653, 39654, 39655, 39656, 39657, 39660, 39662, 39668, 39669, 39670, 39677, 39678, 39680, 39683, 39684, 39688, 39689, 39690, 39696, 39697, 39699, 39701, 39702, 39703, 39711, 39718, 39719, 39720, 39727, 39884, 39957

PRESSURE (ATMOSPHERIC)
39616, 39704

PRIMATES (NON-HUMAN)
39838

PRINTING AND PUBLISHING
38854, 39600, 40006

PROCESS MODIFICATION
38853, 38857, 38859, 38865, 38871, 38873, 38884, 38885, 38908, 38911, 38915, 38926, 38928, 38959, 38962, 38966, 38971, 38996, 39004, 39009, 39020, 39024, 39027, 39029, 39036, 39042, 39047, 39050, 39058, 39062, 39068, 39069, 39071, 39073, 39083, 39090, 39093, 39099, 39107, 39116, 39118, 39127, 39128, 39129, 39136, 39137, 39140, 39147, 39151, 39153, 39156, 39158, 39167, 39168, 39176, 39184, 39185, 39188, 39192, 39193, 39194, 39201, 39204, 39208, 39209, 39222, 39226, 39227, 39239, 39241, 39252, 39269, 39271, 39279, 39281, 39283, 39286, 39288, 39289, 39290, 39293, 39304, 39305, 39316, 39333, 39334, 39337, 39340, 39342, 39360, 39370, 39458, 39761, 39774, 40032

PROPANES
39506, 39517, 39760, 39774

PROPELLER AIRCRAFT
39042

PROPOSALS
40058

PROTEINS
39804, 39809, 39819, 39828, 39854, 39865, 39906, 39924, 39927, 39942, 39968, 39987

PUBLIC AFFAIRS
38969, 39572, 39583, 39584, 39585, 40026, 40027, 40066, 40071, 40072, 40077, 40078, 40080, 40090, 40092, 40095, 40103, 40108, 40121, 40122, 40139, 40140, 40141, 40149, 40150, 40151

PUBLIC INFORMATION
40066, 40071, 40072, 40108, 40122, 40139

PULMONARY FUNCTION
39799, 39820, 39827, 39840, 39853, 39857, 39862, 39877, 39933

PULMONARY RESISTANCE
39857, 39862

PULP MILLS
38932, 38954, 38955, 38956, 38975, 39043, 39055, 39252, 39341, 39592, 40067

PULVERIZED FUELS
38971

PYRENES
38966, 39600, 39612, 39806, 39840, 39852, 39875, 39902

PYRIDINES
39415

PYROLYSIS
39269, 39462, 39508, 39735, 39738, 39740, 39756

Q

QUARTZ
39467, 39754, 39887

QUENCHING
38971, 39124, 39370

QUESTIONNAIRES
38878, 39585, 39801, 39823, 39850, 39890, 40121, 40139, 40140

R

RABBITS
38969, 39803, 39804, 39836, 39837, 39870, 39876

RADIATION MEASURING SYSTEMS
39388, 39430, 39492, 39523, 39586

RADIOACTIVE RADIATION
38886, 38930, 39012, 39038, 39186, 39414, 39424, 39443, 39452, 39460, 39467, 39492, 39508, 39516, 39523, 39633, 39881, 39905, 40148

RADIOACTIVE TRACERS
39689, 39691, 39824

RADIOGRAPHY
39823, 39870, 39877

RADIOSONDES
39643

RAILROAD VEHICLES
39276

RAIN
38985, 39461, 39472, 39591, 39605, 39609, 39633, 39642, 39647, 39651, 39656, 39657, 39662, 39669, 39670, 39678, 39683, 39684, 39688, 39689, 39690, 39697, 39699, 39701, 39720, 39884

RANKINE CYCLE ENGINES
38892, 38948, 38950, 39097, 39126, 39145, 39147, 39177, 39199, 39229, 39247, 39285, 39296, 39300, 39319, 39368

RAPPING
39021, 39060, 39074, 39244, 39344

RATS
39800, 39816, 39817, 39821, 39822, 39830, 39836, 39843, 39856, 39863, 39885, 39887, 39924, 39925

REACTION KINETICS
38879, 38896, 38909, 39045, 39048, 39050, 39059, 39083, 39088, 39091, 39197, 39235, 39239, 39275, 39281, 39287, 39631, 39638, 39646, 39738, 39742, 39744, 39751, 39753, 39755, 39756, 39761, 39762, 39763, 39764, 39767, 39771, 39773, 39774, 39776, 39786, 39954

REACTION MECHANISMS
38848, 38896, 38913, 38947, 38975, 39022, 39045, 39048, 39050, 39059, 39088, 39100, 39128, 39156, 39188, 39197, 39222, 39239, 39253, 39288, 39337, 39355, 39630, 39641, 39673, 39699, 39703, 39728, 39740, 39744, 39746, 39751, 39755, 39760, 39761, 39764, 39767, 39774, 39782, 39783, 39786, 39818, 39954, 39990

REACTORS (NUCLEAR)
38993, 39722

RECOMBINATION
39740

RECORDING METHODS
39444, 39463, 39479, 39624, 39697, 39722, 39997

RECREATION AREAS
38891, 38922, 38924, 39608, 39714, 39865

REDUCTION
39013, 39049, 39080, 39117, 39140, 39163, 39261, 39271, 39351, 39361, 39733, 39736, 39741, 39754

REFRACTIVE INDEX
39770

REFUSE SYSTEMS
38854, 38856, 38876, 38879, 38880, 38881, 38886, 38895, 38904, 38911, 38915, 38917, 38926, 38927, 38937, 38954, 38959, 38963, 38972, 38977, 38996, 39003, 39010, 39025, 39032, 39043, 39054, 39060, 39066, 39069, 39090, 39098, 39108, 39137, 39147, 39157, 39173, 39207, 39259, 39293, 39316, 39335, 39341, 39353, 39367, 39372, 39412, 39505, 39529, 39606, 39749, 39801, 40012, 40067, 40108, 40113, 40128

REGULATIONS
38859, 38901, 38932, 39042, 39047, 39130, 39152, 39301, 39341, 39423, 39530, 39585, 39597, 39846, 40007, 40015, 40026, 40030, 40032, 40035, 40039, 40041, 40042, 40045, 40046, 40052, 40054, 40057, 40061, 40062, 40063, 40067, 40068, 40069, 40070, 40071, 40076, 40087, 40088, 40089, 40090, 40092, 40095, 40098, 40101, 40107, 40111, 40113, 40120, 40127, 40128, 40131, 40147, 40151

REPRODUCTION (BIOLOGICAL)
39795, 39839, 39840, 39848, 39919

RESEARCH INSTITUTES
40116

RESEARCH METHODOLOGIES
39454, 39531, 39543, 39546, 39549, 39573, 39617, 39699, 40118, 40122, 40132, 40148

RESEARCH PROGRAMS
38955, 39014, 39036, 39073, 39123, 39126, 39132, 39139, 39141, 39166, 39170, 39171, 39177, 39179, 39180, 39181, 39189, 39198, 39199, 39200, 39203, 39214, 39217, 39238, 39242, 39247, 39251, 39254, 39266, 39284, 39285, 39296, 39336, 39350, 39461, 39472, 39534, 39538, 39555, 39558, 39587, 39643, 39651, 39652, 39653, 39654, 39660, 39668, 39669, 39670, 39671, 39674, 39675, 39683, 39684, 39688, 39689, 39690, 39701, 39808, 39834, 39902, 39931, 40065, 40109, 40122, 40128, 40133, 40134, 40135, 40136, 40137, 40152

RESIDENTIAL AREAS
38952, 39462, 39572, 39590, 39833, 40037, 40128

RESIDUAL OILS
38853, 38859, 38865, 38884, 38996, 39020, 39023, 39024, 39027, 39029, 39085, 39185, 39208, 39226, 39227, 39604, 39768

RESPIRATION (PLANTS)
39962, 39985, 39992

RESPIRATORY DISEASES
39583, 39798, 39799, 39802, 39810, 39811, 39814, 39816, 39823, 39833, 39842, 39844, 39845, 39850, 39853, 39854, 39855, 39857, 39858, 39860, 39862, 39868, 39870, 39874, 39876, 39877, 39882, 39887, 39889, 39890, 39892, 39893, 39900, 39902, 39904, 39905, 39907, 39909, 39910, 39911, 39914, 39917, 39920, 39923, 39925, 39927, 39928, 39929, 39930, 39931, 39934, 40021

RESPIRATORY SYSTEM
39503, 39794, 39797, 39803, 39804, 39809, 39811, 39816, 39817, 39820, 39821, 39823, 39832, 39840, 39842, 39844, 39851, 39852, 39855, 39856, 39857, 39858, 39859, 39870, 39873, 39874, 39876, 39880, 39891, 39893, 39905, 39909, 39910, 39911, 39913, 39917, 39923, 39924, 39925, 39927, 39932, 39933

RETENTION
38961, 38969, 39503, 39549, 39701, 39788, 39797, 39800, 39807, 39816, 39825, 39843, 39849, 39858, 39867, 39881, 39885, 39891, 39895, 39896, 39897, 39899, 39901, 39906, 39908, 39909, 39915, 39916, 39922, 39944, 39951, 39960, 39962, 39965, 39990, 39994, 40144

RHODE ISLAND
40072

RINGELMANN CHART
39274

ROADS
38904, 38906, 38917, 38921, 38930, 38931, 38939, 38941, 38961, 39374, 39431, 39462, 39549, 39580, 39591, 39594, 39600, 39603, 39614, 39617, 39622, 39700, 39701, 39712, 39790, 39801, 39805, 39825, 39826, 39827, 39868, 39922, 39960, 39991, 39992, 40047, 40115

ROTARY ENGINES
39097, 39131, 39206

ROTARY PISTON ENGINES
39097, 39131, 39206

RUBBER
39385, 39462

S

SAFETY EQUIPMENT
39057, 39456, 39517

SALTZMAN METHOD (NOX)
39412, 39489, 39512, 39550, 40096

SAMPLERS
38850, 39077, 39330, 39431, 39451, 39481, 39483, 39492, 39494, 39496, 39497, 39523, 39524, 39535, 39552, 39564, 39570, 40044

SAMPLING PROBES
39387, 39478, 39548

SANITARY SERVICES
38854, 38856, 38875, 38876, 38879, 38880, 38881, 38886, 38895, 38904, 38911, 38915, 38917, 38926, 38927, 38937, 38954, 38959, 38963, 38972, 38975, 38977, 38993, 38996, 39003, 39006, 39010, 39025, 39032, 39043, 39054, 39060, 39066, 39069, 39090, 39098, 39108, 39137, 39138, 39147, 39157, 39173, 39176, 39207, 39219, 39259, 39280, 39293, 39316, 39335, 39341, 39353, 39367, 39372, 39374, 39412, 39505, 39529, 39606, 39749, 39801, 40012, 40027, 40067, 40108, 40113, 40128

SAPPORO
39597, 39677, 39678

SCANDINAVIA
38926, 38955, 38983, 38984, 39004, 39053, 39055, 39206, 39217, 39238, 39244, 39247, 39258, 39371, 39440, 39456, 39593, 39642, 39663, 39664, 39687, 39702, 39849, 39891

SCATTERING (ATMOSPHERIC)
39426, 39620, 39692, 39714, 39721

SCREEN FILTERS
39060, 39260

SCRUBBERS
38860, 38871, 38879, 38908, 38937, 38943, 38975, 38977, 38981, 38983, 38986, 38987, 38988, 38992, 39007, 39027, 39035, 39043, 39046, 39050, 39055, 39056, 39060, 39070, 39075, 39084, 39102, 39104, 39105, 39108, 39110, 39119, 39124, 39135, 39137, 39138, 39164, 39165, 39168, 39169, 39182, 39183, 39187, 39193, 39207, 39210, 39211, 39220, 39234, 39237, 39246, 39248, 39256, 39259, 39260, 39267, 39268, 39273, 39280, 39292, 39303, 39308, 39310, 39312, 39315, 39320, 39323, 39325, 39328, 39329, 39332, 39334, 39336, 39338, 39341, 39342, 39348, 39351, 39356, 39358, 39369, 39375, 39376, 39377, 39401, 39999, 40005, 40006, 40008, 40092

SEA BREEZE
39623, 39705, 39722

SEA SALTS
39658, 39698

SEALS
39264

SECONDARY AIR
39058, 39116, 39151, 39204, 39288, 39340, 39360

SEDIMENTATION
39060, 39118

SEDIMENTATION (CONTROL)
39183, 39352, 39372, 39632

SELENIUM COMPOUNDS
39442

SETTLING CHAMBERS
39060, 39352

SETTLING PARTICLES
38850, 38860, 38865, 38868, 38869, 38886, 38888, 38908, 38911, 38916, 38917, 38918, 38945, 38947, 38952, 38958, 38960, 38969, 38970, 38972, 38973, 38974, 38983, 38985, 38987, 38988, 38990, 38996, 38998, 39008, 39013, 39018, 39020, 39028, 39033, 39041, 39044, 39056, 39060, 39063, 39071, 39074, 39077, 39087, 39089, 39092, 39104, 39105, 39113, 39154, 39183, 39210, 39220, 39244, 39245, 39246, 39258, 39263, 39279, 39282, 39288, 39299, 39308, 39312, 39315, 39327, 39328, 39335, 39342, 39344, 39347, 39349, 39359, 39367, 39369, 39370, 39375, 39376, 39377, 39382, 39387, 39389, 39395, 39397, 39403, 39408, 39412, 39417, 39424, 39433, 39434, 39436, 39442, 39443, 39451, 39457, 39462, 39463, 39467, 39476, 39503, 39505, 39516, 39521, 39523, 39525, 39548, 39563, 39564, 39565, 39573, 39583, 39585, 39586, 39589, 39593, 39594, 39601, 39602, 39607, 39608, 39610, 39611, 39614, 39621, 39629, 39632, 39634, 39647, 39648, 39658, 39698, 39709, 39715, 39740, 39756, 39759, 39761, 39767, 39770, 39771, 39790, 39805, 39807, 39816, 39817, 39824, 39831, 39853, 39875, 39882, 39891, 39893, 39894, 39895, 39902, 39904, 39912, 39913, 39914, 39920, 39924, 39934, 39962, 39981, 40030, 40044, 40116, 40145, 40150, 40151

SEWAGE TREATMENT
38875, 38975, 38993, 39341, 40027

SEWERAGE SYSTEMS
38875, 38975, 38993, 39076, 39108, 39138, 39176, 39207, 39219, 39259, 39280, 39341, 39367, 39374, 40027

SEWERS
39374

SHEEP
39840

SILICATES
39698, 39726

SILICON COMPOUNDS
39476, 39516, 39698, 39726

SILICON DIOXIDE
39728, 39887, 39912

SILICOSIS
39887

SILVER COMPOUNDS
39727, 39915

SIMULATION
38899, 39091, 39103, 39171, 39636, 39637, 39640, 39641, 39704, 39872, 40119

SINTERING
38954, 39060, 39234

SINUSES
39893

SKIN (ANATOMY)
39485, 39805, 39816, 39831, 39880, 39942, 39946

SKIN TESTS
39847

SLUDGE
39108, 39138, 39176, 39207, 39219, 39259, 39280, 39367

SMOG
38859, 38862, 38874, 38960, 39441, 39579, 39585, 39590, 39597, 39623, 39631, 39645, 39667, 39737, 39751, 39753, 39782, 39783, 39786, 39820, 39834, 39835, 39846, 39858, 39859, 39889, 39893, 39904, 39913, 39955, 39997, 40042, 40116, 40146, 40149, 40150

SMOKE SHADE
39274, 39453

SMOKEMETERS
39383, 39403, 39448, 39492, 39505, 39530

SMOKES
38854, 38863, 38865, 38888, 38899, 38901, 38913, 38917, 38960, 38969, 38977, 38986, 39047, 39127, 39137, 39148, 39184, 39240, 39241, 39244, 39250, 39288, 39291, 39320, 39383, 39403, 39468, 39479, 39505, 39525, 39530, 39537, 39611, 39666, 39691, 39757, 39785, 39804, 39893, 39933, 39953, 39989, 40042, 40098, 40130, 40140, 40141

SMOKING
39537, 39611, 39799, 39803, 39804, 39806, 39825, 39827, 39840, 39841, 39845, 39850, 39872, 39875, 39890, 39893, 39907, 39909, 39913, 39930

SNOW
39635, 39677, 39678, 39680

SOAP AND DETERGENT PLANTS
39913, 40006

SOAP MANUFACTURING
40006

SOCIAL ATTITUDES
40140, 40141

SOCIO-ECONOMIC FACTORS
38851, 38861, 38884, 38892, 38900, 38932, 38946, 38961, 38965, 38979, 39218, 39248, 39294, 39701, 39708, 39798, 39992, 40003, 40004, 40009, 40010, 40014, 40016, 40017, 40020, 40117, 40120, 40124, 40129, 40133, 40140, 40142

SODIUM CHLORIDE
39045, 39100, 39182, 39698

SODIUM COMPOUNDS
38851, 39045, 39091, 39100, 39169 39182, 39223, 39231, 39259, 39400, 39670, 39696, 39698, 39773, 39961, 40092

SODIUM HYDROXIDE
39773

SODIUM SULFITE
38851, 39169, 39223, 40092

SOILING
38908, 40139

SOILS
38890, 38919, 38961, 38969, 39386, 39427, 39549, 39586, 39701, 39715, 39792, 39824, 39849, 39991, 39992

SOLAR RADIATION
38942, 39575, 39620, 39623, 39648, 39692, 39714, 39737, 39772, 39782, 39834

SOLVENTS
38854, 38857, 38862, 38910, 38937, 38992, 39019, 39094, 39109, 39278, 39356, 39515, 39586, 39765, 39786, 39816, 40149

SOOT
38850, 38865, 38868, 38869, 38888, 38911, 38952, 38960, 38974, 39044, 39060, 39071, 39089, 39282, 39288, 39443, 39585, 39589, 39740, 39756, 39761, 39767, 39771, 40145

SOURCE MONITORING
38904, 38927, 39069, 39406, 39454, 39534, 39548, 39564

SOUTH PACIFIC
39572, 39965, 40109

SOX CONTROL
38882, 38884, 38918, 38926, 38928, 38932, 38954, 38959, 38976, 38983, 39007, 39023, 39024, 39045, 39046, 39051, 39081, 39084, 39100, 39105, 39106, 39110, 39117, 39120, 39146, 39154, 39164, 39169, 39197, 39208, 39223, 39230, 39232, 39233, 39235, 39239, 39268, 39294, 39302, 39309, 39317, 39318, 39322, 39332, 39350, 39351, 39378, 39379, 39733, 40005, 40008, 40029, 40039, 40062, 40065, 40092

SPARK IGNITION ENGINES
38850, 38855, 38877, 38892, 38931, 38997, 39097, 39099, 39172, 39265, 39288, 39357

SPARK TIMING
38855, 39022, 39042, 39130, 39178, 39249, 39298, 39354

SPECTROMETRY
38910, 39385, 39388, 39398, 39399, 39400, 39407, 39410, 39412, 39424, 39433, 39443, 39445, 39447, 39449, 39460, 39474, 39480, 39482, 39485, 39488, 39490, 39500, 39515, 39516, 39520, 39529, 39542, 39551, 39552, 39566, 39603, 39697, 39730, 39747, 39768, 39772, 39881

SPECTROPHOTOMETRY
38971, 39124, 39295, 39370, 39412, 39413, 39414, 39415, 39424, 39440, 39447, 39464, 39467, 39519, 39526, 39551, 39567, 39739, 39770, 39881, 39993, 40096

SPORES
39853, 39972, 40138

SPRAY TOWERS
39124, 39182, 39234, 39310, 39320, 39341

SPRAYS
39463, 39759, 39913, 39981

ST LOUIS
39461, 39472, 39587, 39613, 39643, 39651, 39652, 39653, 39654, 39656, 39657, 39660, 39662, 39668, 39669, 39670, 39671, 39674, 39683, 39684, 39688, 39689, 39690

STABILITY (ATMOSPHERIC)
38891, 38922, 38923, 38924, 38982, 39061, 39301, 39465, 39522, 39605, 39623, 39631, 39637, 39639, 39659, 39660, 39684, 39691, 39722, 39871

STACK GASES
38851, 38853, 38859, 38862, 38865, 38868, 38871, 38873, 38874, 38879, 38880, 38881, 38882, 38884, 38886, 38902, 38904, 38908, 38915, 38916, 38926, 38927, 38928, 38930, 38932, 38945, 38951, 38954, 38955, 38959, 38960, 38962, 38968, 38969, 38971, 38972, 38973, 38974, 38976, 38977, 38978, 38983, 38988, 38992, 38994, 39013, 39019, 39020, 39023, 39024, 39025, 39032, 39034, 39035, 39036, 39038, 39039, 39044, 39045, 39049, 39050, 39051, 39054, 39055, 39056, 39057, 39059, 39060, 39061, 39070, 39071, 39073, 39074, 39076, 39077, 39084, 39091, 39096, 39098, 39100, 39101, 39106, 39108, 39109, 39110, 39117, 39118, 39120, 39122, 39124, 39135, 39141, 39151, 39152, 39164, 39165, 39169, 39182, 39185, 39197, 39207, 39218, 39219, 39226, 39230, 39231, 39232, 39233, 39234, 39237, 39239, 39241, 39248, 39252, 39256, 39258, 39259, 39260, 39267, 39268, 39269, 39271, 39273, 39274, 39280, 39286, 39289, 39290, 39292, 39294, 39307, 39309, 39310, 39311, 39312, 39315, 39316, 39317, 39320, 39325, 39328, 39329, 39332, 39334, 39339, 39342, 39348, 39350, 39351, 39356, 39360, 39362, 39365, 39367, 39369, 39370, 39373, 39375, 39378, 39379, 39384, 39387, 39406, 39408, 39415, 39422, 39439, 39490, 39491, 39492, 39499, 39500, 39505, 39506, 39513, 39563, 39568, 39583, 39585, 39621, 39664, 39693, 39707, 39710, 39713, 39717, 39738, 39742, 39841, 39866, 39875, 39895, 39900, 39907, 39999, 40008, 40012, 40032, 40039, 40040, 40062, 40065, 40092, 40128, 40139

STACK MONITORING
38904, 38927, 39069, 39454, 39548, 39564

STACKS
38899, 38969, 39044, 39061, 39583, 39621, 39636, 39664, 39693, 39707, 39717, 40128

STATE GOVERNMENTS
39423, 39606, 40079, 40097, 40103, 40113, 40115, 40125, 40153

STATIONARY EMISSION SOURCES
38848, 38849, 38851, 38852, 38853, 38854, 38855, 38856, 38857, 38859, 38860, 38861, 38862, 38863, 38865, 38868, 38870, 38871, 38872, 38873, 38874, 38875, 38876, 38879, 38880, 38881, 38882, 38884, 38886, 38889, 38894, 38895, 38898, 38902, 38904, 38908, 38911, 38914, 38915, 38916, 38917, 38918, 38920, 38925, 38926, 38927, 38928, 38929, 38930, 38932, 38935, 38937, 38938, 38943, 38944, 38946, 38947, 38948, 38949, 38950, 38951, 38952, 38953, 38954, 38955, 38956, 38957, 38958, 38959, 38960, 38962, 38963, 38965, 38966, 38968, 38969, 38970, 38971, 38972, 38974, 38975, 38977, 38978, 38979, 38980, 38982, 38983, 38984, 38985, 38988, 38993, 38994, 38995, 38996, 38998, 39001, 39002, 39003, 39006, 39007, 39009, 39010, 39011, 39013, 39019, 39020, 39021, 39023, 39024, 39025, 39027, 39028, 39029, 39031, 39032, 39034, 39036, 39039, 39041, 39043, 39046, 39050, 39054, 39055, 39057, 39060,

39061, 39063, 39065, 39066, 39069, 39070, 39071, 39073, 39074, 39079, 39083, 39084, 39085, 39087, 39088, 39089, 39090, 39092, 39093, 39094, 39096, 39098, 39100, 39104, 39105, 39106, 39107, 39108, 39110, 39121, 39122, 39124, 39125, 39126, 39128, 39129, 39130, 39134, 39136, 39137, 39138, 39139, 39140, 39141, 39142, 39145, 39147, 39149, 39150, 39151, 39153, 39154, 39155, 39157, 39158, 39161, 39162, 39164, 39167, 39171, 39172, 39173, 39174, 39175, 39176, 39179, 39181, 39185, 39187, 39188, 39189, 39192, 39193, 39194, 39195, 39196, 39199, 39201, 39205, 39207, 39208, 39209, 39212, 39213, 39215, 39217, 39218, 39219, 39222, 39225, 39226, 39227, 39229, 39234, 39235, 39237, 39239, 39241, 39242, 39243, 39246, 39251, 39252, 39254, 39255, 39257, 39259, 39263, 39266, 39268, 39271, 39272, 39275, 39278, 39279, 39280, 39281, 39283, 39284, 39285, 39286, 39288, 39290, 39291, 39293, 39294, 39298, 39300, 39302, 39304, 39307, 39316, 39318, 39320, 39321, 39322, 39327, 39328, 39331, 39333, 39334, 39335, 39337, 39341, 39342, 39347, 39348, 39349, 39350, 39352, 39353, 39356, 39364, 39367, 39370, 39372, 39374, 39375, 39376, 39377, 39379, 39384, 39403, 39408, 39412, 39422, 39451, 39452, 39465, 39467, 39476, 39485, 39487, 39491, 39492, 39505, 39506, 39517, 39529, 39530, 39571, 39578, 39579, 39585, 39590, 39592, 39596, 39597, 39600, 39604, 39606, 39613, 39614, 39624, 39625, 39636, 39640, 39649, 39693, 39708, 39717, 39722, 39733, 39738, 39739, 39742, 39744, 39749, 39761, 39767, 39768, 39785, 39791, 39801, 39808, 39837, 39846, 39866, 39867, 39873, 39880, 39883, 39884, 39898, 39900, 39913, 39939, 39940, 39942, 39953, 39969, 39989, 39999, 40000, 40001, 40002, 40005, 40006, 40007, 40008, 40010, 40011, 40012, 40017, 40018, 40022, 40025, 40027, 40028, 40029, 40032, 40033, 40034, 40039, 40042, 40050, 40051, 40057, 40062, 40064, 40065, 40066, 40067, 40069, 40070, 40075, 40076, 40083, 40084, 40086, 40090, 40092, 40094, 40105, 40108, 40113, 40121, 40122, 40128, 40131, 40137, 40139, 40144, 40145, 40147, 40149, 40152, 40153

STATISTICAL ANALYSES
39275, 39287, 39389, 39469, 39484, 39536, 39574, 39580, 39598, 39617, 39618, 39629, 39643, 39669, 39676, 39724, 39753, 39784, 39789, 39793, 3983 39869, 39888, 39909, 40038, 40139

STEAM
38964, 38975, 38977, 39044, 39209, 39226, 39260, 39271, 39398, 40130

STEAM ELECTRIC POWER GENERATION
38851, 38853, 38872, 38929, 38946, 38950, 38958, 38962, 38996, 38998, 39046, 39087, 39107, 39108, 39110, 39125 39147, 39150, 39151, 39153, 39167, 39173, 39192, 39193, 39194, 39227, 39229, 39239, 39255, 39279, 39302, 39333, 39347, 39364, 40000, 40011, 40012, 40034

STEAM ENGINES
38892, 38948, 38950, 39097, 39126, 39145, 39147, 39177, 39199, 39229, 39247, 39285, 39296, 39300, 39319, 39368

STEEL
38954, 38955, 38979, 39073, 39074, 39327, 39328, 39340, 39377, 39378, 39451, 39710, 40020

STOMACH
39816, 39868

STONE
38860, 39754

STRATIFIED CHARGE ENGINES
38948, 39097, 39099, 39170, 39251, 39254

STREETS
38904, 38906, 38930, 39374, 39431, 39591, 39600, 39614, 39617 39700, 39790, 39801, 39805, 39825, 39826, 39827, 39868, 39960

STRONTIUM COMPOUNDS
39091, 39400, 39916

STRUCTURES
38897, 38941, 39026, 39502, 39576, 39600, 39790, 39980, 39998, 40044, 40143, 40146

STYRENES
39385, 39402

SUBSURFACE STRUCTURES
38941, 39576

SULFATES
38851, 38880, 39169, 39223, 39311, 39498, 39570, 39595, 39642, 39647, 39650, 39697, 39698, 39702, 39775, 39808, 39961

SULFIDES
38875, 38908, 38932, 38975, 38976, 38978, 38998, 39006, 39007, 39012, 39027, 39054, 39055, 39081, 39105, 39115, 39122, 39142, 39146, 39154, 39187, 39232, 39233, 39235, 39272, 39289, 39290, 39292, 39310, 39313, 39322, 39341, 39356, 39362, 39365, 39373, 39379, 39383, 39384, 39394, 39421, 39435, 39494, 39501, 39511, 39512, 39513, 39515, 39520, 39521, 39592, 39611, 39726, 39743, 39765, 39775, 39851, 39986

SULFITES
39055, 39075, 39157, 39223, 39924

SULFUR COMPOUNDS
38851, 38875, 38880, 38898, 38902, 38908, 38910, 38932, 38968, 38975, 38976, 38978, 38993, 38998, 39002, 39006, 39007, 39011, 39012, 39024, 39027, 39034, 39054, 39055, 39075, 39081, 39089, 39105, 39106, 39115, 39117, 39122, 39135, 39140, 39141, 39142, 39146, 39150, 39154, 39157, 39169, 39187, 39212, 39223, 39228, 39232, 39233, 39235, 39248, 39257, 39268, 39272, 39289, 39290, 39292, 39310, 39311, 39313, 39322, 39341, 39356, 39362, 39365, 39373, 39379, 39383, 39384, 39386, 39394, 39421, 39425, 39435, 39476, 39493, 39494, 39498, 39501, 39511, 39512, 39513, 39515, 39516, 39520, 39521, 39555, 39570, 39592, 39593, 39595, 39611, 39642, 39647, 39649, 39650, 39697, 39698, 39702, 39720, 39726, 39743, 39765, 39768, 39775, 39808, 39851, 39924, 39961, 39986, 40019, 40034, 40051, 40070, 40083, 40084, 40086, 40090

SULFUR DIOXIDE
38849, 38851, 38865, 38868, 38880, 38883, 38899, 38918, 38925, 38927, 38929, 38933, 38952, 38958, 38959, 38968, 38969, 38974, 38983, 38988, 39012, 39026, 39027, 39051, 39070, 39087, 39091, 39146, 39154, 39169, 39211, 39232, 39234, 39239, 39267, 39289, 39290, 39309, 39310, 39311, 39313, 39322, 39379, 39380, 39384, 39388, 39404, 39406, 39412, 39416, 39421, 39424, 39430, 39433, 39434, 39435, 39439, 39447, 39469, 39471, 39481, 39490, 39494, 39510, 39512, 39513, 39515, 39518, 39520, 39521, 39524, 39534, 39536, 39544, 39570, 39579, 39581, 39583, 39584, 39590, 39596, 39597, 39599, 39604, 39606, 39607, 39608, 39609, 39611, 39619, 39621, 39626, 39630, 39636, 39639, 39649, 39678, 39687, 39693, 39697, 39707, 39710, 39717, 39732, 39736, 39737, 39742, 39746, 39747, 39748, 39776, 39782, 39783, 39798, 39815, 39832, 39834, 39851, 39857, 39859, 39870, 39871, 39876, 39882, 39893, 39904, 39914, 39923, 39924, 39934, 39952, 39953, 39954, 39961, 39962, 39966, 39967, 39972, 39974, 39977, 39978, 39979, 39980, 39981, 39983, 39986, 39987, 39990, 39995, 40005, 40018, 40025, 40029, 40030, 40042, 40065, 40077, 40107, 40124, 40140, 40141, 40150, 40151

SULFUR ORGANIC COMPOUNDS
38875, 38932, 38975, 39006, 39007, 39054, 39256, 39341, 39365, 39386, 39501, 39592

SULFUR OXIDES
38849, 38851, 38865, 38868, 38880, 38883, 38899, 38901, 38908, 38911, 38918, 38925, 38926, 38927, 38928, 38929, 38933, 38952, 38953, 38958, 38959, 38968, 38969, 38974, 38983, 38988, 38996, 39012, 39018, 39023, 39026, 39027, 39038, 39051, 39070, 39077, 39085, 39087, 39091, 39146, 39154, 39169, 39208, 39211, 39231, 39232, 39234, 39239, 39267, 39288, 39289, 39290, 39309, 39310, 39311, 39313, 39322, 39379, 39380, 39384, 39388, 39394, 39395, 39404, 39406, 39408, 39412, 39416, 39421, 39424, 39430, 39433, 39434, 39435, 39439, 39447, 39469, 39471, 39476, 39481, 39490, 39494, 39510, 39512, 39513, 39515, 39518, 39520, 39521, 39524, 39534, 39536, 39544, 39570, 39579, 39581, 39583, 39584, 39585, 39588, 39589, 39590, 39594, 39595, 39596, 39597, 39599, 39604, 39605, 39606, 39607, 39608, 39609, 39611, 39613, 39619, 39621, 39626, 39630, 39636, 39639, 39645, 39649, 39677, 39678, 39687, 39693, 39697, 39707, 39710, 39717, 39728, 39732, 39736, 39737, 39742, 39746, 39747, 39748, 39776, 39782, 39783, 39798, 39815, 39832, 39833, 39834, 39851, 39857, 39859, 39870, 39871, 39876, 39882, 39893, 39904, 39914, 39923, 39924, 39934, 39952, 39953, 39954, 39961, 39962, 39966, 39967, 39971, 39972, 39974, 39977, 39978, 39979, 39980, 39981, 39983, 39986, 39987, 39990, 39995, 40003, 40005, 40018, 40025, 40029, 40030, 40037, 40039, 40042, 40045, 40062, 40065, 40077, 40090, 40096, 40107, 40124, 40130, 40140, 40141, 40150, 40151

SULFUR TRIOXIDE
38968, 38983, 39077, 39169, 39239, 39309, 39570, 39604, 39728

SULFURIC ACID
38851, 38983, 39070, 39218, 39268, 39294, 39332, 39337, 39338, 39378, 39404, 39428, 39570, 39619, 39630, 39782, 39783, 39940, 39961

SUPERSATURATION
39784

SURFACE COATING OPERATIONS
38857, 38862, 38994, 39019, 39084, 39094, 39108, 39999

SURFACE COATINGS
38857, 38862, 39109, 39785, 39787, 39824, 39998, 39999

SURFACE PROPERTIES
38999, 39006, 39183, 39211, 39730, 39733, 39756, 39763, 39954

SURVEY METHODS
39363, 39426, 39434, 39502, 39545, 39557, 39582, 39585, 39618, 39793, 39801, 39834, 39850, 40036, 40038, 40043, 40045, 40072, 40096, 40109, 40116, 40117, 40135

SUSPENDED PARTICULATES
38848, 38854, 38857, 38859, 38862, 38863, 38865, 38874, 38880, 38888, 38897, 38899, 38901, 38908, 38910, 38913, 38917, 38919, 38942, 38960, 38969, 38977, 38981, 38986, 39044, 39047, 39059, 39060, 39127, 39128, 39137, 39139, 39148, 39155, 39182, 39184, 39195, 39219, 39220, 39240, 39241, 39244, 39250, 39259, 39267, 39280, 39288, 39291, 39306, 39307, 39313, 39320, 39335, 39337, 39338, 39347, 39358, 39383, 39385, 39397, 39403, 39408, 39417, 39422, 39431, 39441, 39452, 39465, 39468, 39473, 39479, 39496, 39505, 39525, 39530, 39531, 39537, 39556, 39579, 39580, 39583, 39584, 39585, 39590, 39594, 39597, 39603, 39605, 39606, 39607, 39611, 39623, 39626, 39630, 39631, 39635,

39641, 39645, 39666, 39667, 39678, 39691, 39705, 39714, 39721, 39737, 39751, 39753, 39757, 39782, 39783, 39785, 39786, 39804, 39820, 39834, 39835, 39846, 39858, 39859, 39866, 39889, 39893, 39895, 39904, 39907, 39913, 39924, 39933, 39953, 39955, 39989, 39997, 40003, 40018, 40034, 40037, 40042, 40081, 40098, 40116, 40130, 40140, 40141, 40145, 40146, 40149, 40150

SWEDEN
38926, 38955, 38983, 38984, 39053, 39055, 39206, 39217, 39238, 39247, 39258, 39371, 39440, 39456, 39664, 39702

SYNERGISM
39797, 39806, 39830, 39900, 39907, 39952, 39972, 39977, 39978, 39980, 39983, 40029

SYNTHETIC FIBERS
38915, 38979, 39031, 39187

T

TAR (MATERIAL)
39600

TAXATION
40018, 40104, 40113

TEFLON
38979, 39428

TEMPERATURE
38855, 38859, 38867, 38869, 38873, 38887, 38899, 38909, 38915, 38959, 38982, 38993, 39020, 39027, 39029, 39038, 39039, 39057, 39068, 39077, 39078, 39083, 39087, 39094, 39140, 39151, 39156, 39158, 39184, 39222, 39224, 39227, 39241, 39271, 39281, 39282, 39291, 39302, 39309, 39310, 39325, 39340, 39346, 39366, 39401, 39428, 39464, 39484, 39506, 39513, 39575, 39642, 39666, 39693, 39704, 39732, 39735, 39738, 39741, 39754, 39760, 39761, 39771, 39772, 39776, 39784, 39900

TEMPERATURE (ATMOSPHERIC)
38899, 38985, 39061, 39465, 39521, 39583, 39590, 39599, 39605, 39609, 39610, 39616, 39617, 39629, 39648, 39652, 39675, 39679, 39685, 39686, 39691, 39693, 39697, 39704, 39711, 39722, 39834, 39900, 39904, 39917, 39924, 39990, 40096

TEMPERATURE SENSING INSTRUMENTS
39540

TENNESSEE
39466, 39626, 40087

TEST ENGINES
39132, 39171, 40063

TETRAETHYL LEAD
39012, 39739, 40001

TEXAS
38907, 39527

TEXTILE MILLS
39187, 39592, 39837

TEXTILES
38915, 38979, 38990, 39031, 39187, 39313

THERMAL RADIATION
38869, 38886, 39078, 39620, 39624, 39656, 39697, 39772, 40152

THERMODYNAMICS
38887, 38964, 39081, 39150, 39177, 39290, 39355, 39624, 39761, 39774, 39781, 39818

THRESHOLDS
38916, 39515, 39517, 39793, 39800, 39804, 39816, 39822, 39830, 39836, 39852, 39869, 39889, 39918, 39921, 39934, 39935, 39937, 39955, 39956, 39958, 39959, 39968, 39970, 39985, 39990, 39995, 40146

THUNDERSTORMS
39653, 39655, 39656, 39657, 39662, 39689

TIMED FUEL INJECTION
39030, 39127, 39160, 39202, 39253, 39265, 39305

TIN
40105

TIN COMPOUNDS
39442

TIP BURN
39957, 39969, 39977, 39978

TIRES
39385

TISSUE CULTURES
39809

TISSUES
39427, 39549, 39701, 39800, 39870, 39881, 39909, 39916, 39927

TITANIUM COMPOUNDS
39891

TOBACCO
39616, 39968

TOKYO
38852, 38874, 39412, 39580, 39588, 39589, 39598, 39623, 39811, 39834, 39868, 39994, 40037, 40093, 40096, 40107, 40149

TOLUENES
38877, 39289, 39936

TOMATOES
39973, 39985

TOPOGRAPHIC INTERACTIONS
38925, 39605, 39644, 39691, 39700, 39704, 39719, 40024, 40036

TOXIC TOLERANCES
39737, 39821, 39836, 39844, 39852, 39869, 39870, 39879, 39884, 39889, 39897, 39914, 39938, 39952, 39955, 39956, 39959, 39960, 39961, 39963, 39964, 39966, 39967, 39970, 39971, 39972, 39974, 39978, 39980, 39983, 39985, 39987, 39990, 39995

TOXICITY
38895, 38912, 38930, 38931, 38937, 38957, 39084, 39264, 39697, 39737, 39759, 39789, 39793, 39797, 39800, 39804, 39812, 39813, 39816, 39821, 39822, 39830, 39836, 39837, 39838, 39841, 39844, 39848, 39852, 39861, 39863, 39864, 39866, 39869, 39871, 39873, 39878, 39879, 39880, 39881, 39882, 39883, 39884, 39886, 39889, 39891, 39892, 39894, 39896, 39897, 39898, 39900, 39901, 39902, 39905, 39907, 39908, 39910, 39911, 39912, 39918, 39921, 39923, 39933, 39935, 39936, 39937, 39938, 39942, 39944, 39947, 39948, 39949, 39953, 39955, 39956, 39958, 39967, 39972, 39980, 39986, 39987, 39989, 39990, 39995, 39998, 40108, 40122, 40139, 40153

TRACE ANALYSIS
38889, 39381, 39411, 39419, 39426, 39427, 39442, 39443, 39445, 39452, 39488, 39507, 39512, 39513, 39531, 39542, 39546, 39549, 39554, 39573, 39587, 39701, 39881

TRACERS
39622, 39636, 39689, 39691, 39704, 39722, 39824

TRACHEA
39797, 39832, 39842, 39851, 39855, 39857, 39870, 39910, 39925

TRANSMISSOMETERS
39383, 39448, 39492

TRANSPORT
38912, 38951, 38961, 39347, 39426, 39545, 39624, 39632, 39647, 39649, 39663, 39672, 39673, 39687, 39696, 39705, 39706, 39712, 39715, 39716, 39718, 39719, 39720, 39727, 39742, 39779, 39804, 39840, 39908, 39992

TRANSPORTATION METHODS
38852, 38858, 38861, 38872, 38887, 38890, 38891, 38893, 38894, 38896, 38897, 38900, 38901, 38902, 38903, 38904, 38906, 38907, 38911, 38913, 38914, 38917, 38920, 38921, 38922, 38923, 38924, 38930, 38931, 38933, 38939, 38940, 38941, 38952, 38961, 38967, 38980, 38996, 39042, 39047, 39065, 39072, 39078, 39079, 39099, 39114, 39127, 39149, 39156, 39163, 39166, 39175, 39181, 39188, 39189, 39190, 39196, 39207, 39216, 39237, 39240, 39247, 39249, 39250, 39251, 39253, 39254, 39266, 39276, 39280, 39286, 39296, 39297, 39298, 39301, 39314, 39319, 39330, 39347, 39353, 39355, 39388, 39443, 39462, 39465, 39474, 39478, 39479, 39484, 39541, 39575, 39576, 39589, 39590, 39591, 39594, 39606, 39614, 39617, 39628, 39631, 39645, 39661, 39663, 39665, 39673, 39685, 39694, 39700, 39712, 39757, 39787, 39801, 39805, 39813, 39824, 39826, 39829, 39838, 39846, 39850, 39868, 39872, 39895, 39960, 39992, 40002, 40024, 40029, 40040, 40047, 40048, 40050, 40052, 40060, 40063, 40067, 40071, 40089, 40098, 40104, 40108, 40113, 40115, 40116, 40118, 40119, 40125, 40126, 40139, 40144, 40145, 40147, 40149, 40150, 40152, 40153

TRAPPING (SAMPLING)
39473, 39486

TRAY TOWERS
39102

TREATED FABRICS
39380

TREES
39608, 39957, 39960, 39961, 39962, 39969, 39971, 39976, 39981, 39995, 39997

TRENDS
38900, 38901, 38918, 38926, 38931, 38932, 38939, 38946, 38958, 39034, 39085, 39166, 39434, 39588, 39606, 39613, 39623, 39649, 39655, 39696, 39697, 40009, 40010, 40014, 40016, 40109, 40124, 40142, 40150

TRUCKS
38903, 39249, 39280, 39297, 39462

TUBERCULOSIS
39860

TUMORS
39852, 39855, 39868, 39875

TUNNELS
38941, 39576

TURBIDIMETRY
39468, 39648, 39658, 39695, 39723

TURBULENCE (ATMOSPHERIC)
38942, 39336, 39345, 39628, 39631, 39632, 39658, 39659, 39666, 39691, 39712, 39722

U

ULTRASONICS
39183, 39338

ULTRAVIOLET RADIATION
38933, 39508, 39590, 39646, 39663, 39673, 39834, 40096

ULTRAVIOLET SPECTROMETRY
39447, 39449, 39480, 39482, 39490, 39500

UNDERFIRE AIR
39290

UNITED KINGDOM
38881, 38897, 38906, 38926, 38938, 38946, 38950, 38957, 39041, 39099, 39114, 39140, 39148, 39149, 39153, 39167, 39202, 39205, 39224, 39230, 39231, 39232, 39233, 39237, 39276, 39282, 39291, 39295, 39300, 39301, 39302, 39364, 39379, 39383, 39422, 39450, 39459, 39463, 39465, 39467, 39544, 39574, 39577, 39637, 39731, 39755, 39767, 39788, 39792, 39799, 39846, 39953, 39954, 39962, 40001, 40098, 40106, 40138, 40140, 40141, 40142, 40148

UNITED STATES
38849, 38851, 38883, 38889, 38907, 38926, 38931, 38935, 38936, 38939, 38940, 38941, 38965, 39166, 39319, 39419, 39422, 39434, 39461, 39466, 39469, 39472, 39527, 39587, 39598, 39613, 39622, 39626, 39631, 39635, 39639, 39643, 39644, 39651, 39652, 39653, 39654, 39655, 39656, 39657, 39660, 39661, 39662, 39668, 39669, 39670, 39671, 39674, 39679, 39683, 39684, 39688, 39689, 39690, 39696, 39697, 39718, 39737, 39806, 39858, 39996, 40007, 40021, 40024, 40026, 40034, 40050, 40051, 40055, 40056, 40060, 40061, 40062, 40064, 40065, 40066, 40067, 40068, 40070, 40072, 40074, 40075, 40076, 40077, 40078, 40081, 40082, 40083, 40084, 40086, 40087, 40090, 40095, 40100, 40101, 40108, 40113, 40117, 40123, 40124, 40129, 40130, 40132, 40153

UNIVERSITIES
40122

UPPER ATMOSPHERE
38900, 39474, 39631, 39673, 39698

URANIUM COMPOUNDS
39231

URBAN AREAS
38861, 38889, 38890, 38905, 38906, 38931, 38941, 38942, 38959, 39166, 39176, 39342, 39381, 39395, 39419, 39433, 39442, 39461, 39472, 39527, 39570, 39581, 39583, 39584, 39585, 39587, 39588, 39589, 39594, 39595, 39603, 39605, 39607, 39609, 39614, 39615, 39617, 39643, 39651, 39652, 39653, 39654, 39656, 39657, 39658, 39660, 39662, 39668, 39669, 39670, 39671, 39674, 39683, 39684, 39686, 39688, 39689, 39690, 39691, 39697, 39700, 39714, 39718, 39723, 39724, 39783, 39801, 39802, 39806, 39810, 39811, 39824, 39825, 39826, 39827, 39828, 39829, 39831, 39845, 39871, 39882, 39899, 39904, 39913, 39917, 39923, 39932, 39963, 39966, 39994, 40007, 40028, 40045, 40047, 40109, 40110, 40116, 40118, 40120, 40123, 40124, 40129, 40139, 40145, 40147

URINE
39791, 39801, 39807, 39812, 39819, 39823, 39826, 39829, 39865, 39866, 39867, 39939, 39944, 39947, 39951

USSR
38864, 38912, 38966, 38969, 39076, 39151, 39562, 39692, 39759, 39776, 39817, 39830, 39836, 39863, 39886, 39887, 39919, 39961, 40031, 40033, 40099

UTAH
40068

V

VANADIUM COMPOUNDS
39488, 39551, 39579, 39727, 39776, 39918, 39920, 40127

VAPOR RECOVERY SYSTEMS
38908, 39114, 39213, 39357, 40050, 40060, 40076

VAPORS
38857, 38964, 38975, 38977, 39044, 39091, 39182, 39204, 39209, 39226, 39260, 39271, 39358, 39398, 39432, 39477, 39524, 39642, 39646, 39772, 39784, 39816, 39894, 39895, 39933, 39998, 40130

VEGETABLES
39900, 39959, 39970, 39973, 39977, 39978, 39979, 39980, 39982, 39985, 39996

VENTILATION
38867, 38916, 39898, 40143, 40146

VENTILATION (PULMONARY)
39810, 39820, 39862, 39877, 39890, 39940

VENTURI SCRUBBERS
38981, 38986, 39060, 39075, 39102, 39168, 39169, 39246, 39267, 39315, 39323, 39338, 39376

VESSELS (MARINE)
39237, 39541

VETERINARY MEDICINE
39759

VIRUSES
39844, 39972

VISIBILITY
38908, 38942, 39240, 39479, 39815, 39834

VISIBLE RADIATION
39590, 39815, 40096

VOLATILITY
38949, 39243, 39381, 39386

VOLCANOES
39649

VOLTAGE
39016, 39095, 39478

W

WASHINGTON (STATE)
39635, 39696, 40064

WASHINGTON D C
38939

WASHOUT
39591, 39633, 39642, 39647, 39660, 39670, 39677, 39678, 39689, 39699, 39701, 39718, 39719, 39957

WASTE GAS CONTROL
38882, 38884, 38918, 38926, 38928, 38932, 38954, 38959, 38976, 38983, 39007, 39023, 39024, 39045, 39046, 39051, 39081, 39084, 39100, 39105, 39106, 39110, 39117, 39120, 39146, 39154, 39164, 39169, 39197, 39208, 39223, 39230, 39232, 39233, 39235, 39239, 39268, 39294, 39302, 39309, 39317, 39318, 39322, 39332, 39350, 39351, 39378, 39379, 39733, 40005, 40008, 40029, 40039, 40062, 40065, 40092

WASTE GASES
38851, 38853, 38859, 38862, 38865, 38868, 38871, 38873, 38874, 38879, 38880, 38881, 38882, 38884, 38886, 38902, 38904, 38908, 38915, 38916, 38926, 38927, 38928, 38930, 38932, 38945, 38951, 38954, 38955, 38959, 38960, 38962, 38968, 38969, 38971, 38972, 38973, 38974, 38976, 38977, 38978, 38983, 38988, 38992, 38994, 39013, 39019, 39020, 39023, 39024, 39025, 39032, 39034, 39035, 39036, 39038, 39039, 39044, 39045, 39049, 39050, 39051, 39054, 39055, 39056, 39057, 39059, 39060, 39061, 39070, 39071, 39073, 39074, 39076, 39077, 39084, 39091, 39096, 39098, 39100, 39101, 39106, 39108, 39109, 39110, 39117, 39118, 39120, 39122, 39124, 39135, 39141, 39151, 39152, 39164, 39165, 39169, 39182, 39185, 39197, 39207, 39218, 39219, 39226, 39230, 39231, 39232, 39233, 39234, 39237, 39239, 39241, 39248, 39252, 39256, 39258, 39259, 39260, 39267, 39268, 39269, 39271, 39273, 39274, 39280, 39286, 39289, 39290, 39292, 39294, 39307, 39309, 39310, 39311, 39312, 39315, 39316, 39317, 39320, 39325, 39328, 39329, 39332, 39334, 39339, 39342, 39348, 39350, 39351, 39356, 39360, 39362, 39365, 39367, 39369, 39370, 39373, 39375, 39378, 39379, 39384, 39387, 39406, 39408, 39415, 39422, 39439, 39490, 39491, 39492, 39499, 39500, 39505, 39506, 39513, 39563, 39568, 39583, 39585, 39621, 39664, 39693, 39707, 39710, 39713, 39717, 39738, 39742, 39841, 39866, 39875, 39895, 39900, 39907, 39999, 40008, 40012, 40032, 40039, 40040, 40062, 40065, 40092, 40128, 40139

WATER
38933, 38964, 38993, 39091, 39183, 39211, 39270, 39325, 39356, 39388, 39398, 39401, 39646, 39772, 39784

WATER BODIES
3,876, 38886, 38931, 38951, 39063, 39082, 39134, 39176, 39485, 39647, 39670, 39696, 39718, 39727, 39916, 39942, 40058, 40109, 40113, 40128, 40139, 40150, 40151

WATER POLLUTION
38876, 38886, 38931, 38951, 39063, 39082, 39134, 39176, 39485, 39647, 39670, 39696, 39718, 39727, 39916, 39942, 40058, 4009, 40113, 40128, 40139, 40150, 40151

WEATHER FORECASTING
39676, 40110

WEATHER MAPS
39653, 39683

WEATHER MODIFICATION
38900, 38933, 38961, 39061, 39461, 39472, 39545, 39587, 39620, 39642, 39643, 39648, 39651, 39652, 39653, 39654, 39655, 39656, 39657, 39658, 39660, 39662, 39668, 39669, 39671, 39674, 39675, 39683, 39684, 39688, 39689, 39690, 39697, 39701, 39703, 39704, 39711, 39784, 40124

WEST AND GAEKE METHOD (SO2)
39512, 39570

WEST VIRGINIA
40078

WET CYCLONES
39119

WETTING
38917, 39258, 39335, 39347, 39954

WHEAT
39954

WIND ROSE
39639, 39674

WIND TUNNELS
38899, 39640 39666, 39691

WINDS
38860, 38889, 38899, 38924, 39384, 39465, 39521, 39531, 39572, 39579, 39582, 39583, 39587, 39590, 39599, 39607, 39609, 39613, 39616, 39617, 39623, 39624, 39626, 39627, 39629, 39638, 39639, 39640, 39643, 39644, 39651, 39657, 39660, 39662, 39666, 39669, 39674, 39677, 39686, 39691, 39693, 39695, 39704, 39705, 39707, 39712, 39714, 39715, 39722, 39725, 39727, 39759, 39834, 40096, 40109

WISCONSIN
40056, 40095

WOOD (MATERIAL)
38867, 38915

X

X-RAYS
39414, 39424, 39452, 39467, 39516, 39881, 40148

XYLENES
38877, 39494

Y

YOKKAICHI
39802, 39870, 39952, 39971

YOKOHAMA
39576, 39580, 39820, 40094, 40116

Z

ZINC
39334, 40105

ZINC COMPOUNDS
39045, 39580, 39614, 39660, 39670, 39696, 39727, 39801, 39839, 39843, 39863, 39903, 39915, 39919, 40127

AUTHOR INDEX

A

ABBISS J B 39463
ABDELNOUR J *39885
ACKERMAN B *39643
ACKERMAN J 39290
ADACHI M 39833
ADAMIAK ZIEMBA J 39920
ADOMI K 38987
AGARWAL J C 39036
AIO K *39120, *39121
AIZAWA R 39591
AKAO S 39948
AKEKSEYEVA O G *39886
AKIYAMA K 39994
AKIYAMA S 39948
ALBERT R E *39787
ALDERS L *39122
ALEKSANDROV N P *39836
ALEXANDER F W *39788
ALLEN M *39123
ALLEN W R JR *39124
ALM ALL *40034
AMANO M *38847
AMAYA K 38874
ANDERSON C G 39269
ANDERSON G E *39644
ANDO H *39458
ANDO T 39486
ANGLE C R *39789
ANTO W 39746
ANTOPOL W *39790
AOI K *39119
AOIKE H 39169
AOKAGE H 39810
AOYAMA H 39401, 39864
APAKHOV I A 39776
APPLETON J P *39756
ARCHER D H *39125, 39192, 39193, 39194, 39229
ARCHIMBAUD M *39380
ARESCO S J 39011
ARIKADO H *39952, *39971
ARMENTO W J *38971
ARMSTRONG G *38938
ARMSTRONG J *39126
ARNOLD E *38972
ARONOW R 39824
ARONOWITZ L 38967
ARSAC F 39526
ARSTILA A U 39891
ARTOMASOVA L A 39776
ASAHI A 39944
ASAKAWA F 39977, 39978, 39979
ASANO H *38973
ASCIK K *39837
ASTAF EVA I K 39830
ATSUKAWA M *38974
AUGUST P *39326
AUILER J E 39781
AULICIEMS A *39572
AXETELL K JR 38922
AXTELL K JR *38891
AYRES R U *38892, *40010
AYUSAWA T *38893
AZUMA K 39566
AZUMA T *38975
AZUMA Y 38858

B

BABA T 39946, 39947
BABCOCK L R JR *40011, *40012
BACH W *40117
BACK K C *39838
BAHR D W *39127
BAILEY D L *39757
BALAZOVA G *39791
BALDWIN T E 40100
BALL G L 38895
BANOWETZ R A 39131
BANWART W L 39386
BARLEY R C 38878
BARLTROP D *39792
BARNARD P G *39327
BARNES R S *39696
BARR B G *39697
BARRERE M *39128
BARTELDS H 38869
BARTLE E R 39426
BARTLETT R C *40035
BATTLES J E 39228
BAXTER B J *39129
BAYARD DE VOLO N 39281
BAZYDLO P 39527
BEATTY G H 39469
BEAVON D K *38976
BECKER J 39529
BECKER K H *39645
BECKETT S T *39459
BEEBE R C 39683, 39684
BEELER C W 38968
BEHAR J V 39661
BEHRENS M D *39366
BEISING R *38848
BELLOMO S J *40118
BELTRAN M *38977
BENARIE M *39793
BENEDYCKI J *39328
BENEFIEL R L 39042
BENNETT T *39460
BENSON H E *38978
BENSON J R *40000
BERGMANN L *38979
BERGT W *38894
BERINDAN C *40036
BERITIC T *39932
BERMAN E *39794
BERTINE K 39727
BERTSCH W *39381
BERWAGER S D *38939
BEYERMANN K *39382
BEZRODNYKH A A *39887
BIELER B H 39157
BIERMANN A H 39784
BIEWALD H 39362
BILDER R B *40097
BILES B *39383
BINDER K 39641
BINFORD J D *39130
BINTZ L J *39131
BISCH A M 39957
BLAZOWSKI W S 38901
BLOOM M H 39539
BOER P C T D *38980
BOETTGER P *39839
BOETTNER E A *38895
BOKI K *39726
BOLTER E 38951
BONNER T F JR 39079
BONOMETTI G *39384, 39618
BORDAS P 39845
BORGHI R *38896
BORGOS J A 39492
BORMAN G 39062
BOUDENE C *39526
BOURY B 40038
BOUSCAREN R 39621
BRACHACZEK W *39385
BRADBURN G A 39661
BRAEMAR F C *38981
BRAEUSER H W *39373
BRAIL R K *40119
BRANDLE J R 39988
BRANDT H *39329
BRAR J S *40004
BRASSEUR G *39646
BRAUN W *38982
BRECKLE S W 39960
BREMNER J M *39386
BRENNER H *39779
BRESHEARS R *39132
BRESSAN D J *39573
BREZONIK P L *39647
BRIANCON R 39253
BRIAND A 38991
BRICARD J 39429
BRION J *39387
BROCKE W *38958
BROCKHAUS A 39612
BROCKMAN P *39388
BROFT E 39346
BROOKS L H 39129
BROWN C 39383
BROWN R M 39722
BRUCK K *38983
BRUCKMAN L 39805
BRULAND K W *39727
BRUN J 39380
BRUNKOW D *39461
BRUNKOW D A 39683
BRUNNER F A *39617
BRUNS P H 39003
BRUTON D M *38897
BRYAN R J *38849
BUCKHAM J A 39147
BUDDENBERG O 39356
BUECHLEY R W 39614
BUJAK J *39608
BUNAREVIC A 39932
BUNEETIANU G 39890
BURG W R 39441
BURGER K 39571
BURLSON J C 39778
BURNS B *39840
BURRIS L 39228

BURWELL R L JR *39728
BURY BURZYMSKA B 39989
BUSSO R H *38959
BUTTERFIELD N W *39998

C

CADLE R D *38960
CALDWELL R B *39133
CAMPBELL D N 39421
CAMPBELL K I 39800
CAMPS M *39618
CANTWELL A M 39616
CANTWELL E N *39330
CAPP J A *40005
CAPPUCCIO G *39721
CARDINA J A *39462
CARLQVIST S G *38984
CARLS E L 39290
CARLSON T N *39648
CARLTON D M *39331
CARPENTER S J *39795
CARR R A 39573
CARROLL J J *38985
CARTIGNY S *39389
CASAGRANDE J T 39806
CASCI C *39758
CASTLEMAN A W JR *39649, *39650, *39698
CATANEO R *39651, *39652
CAVERS D 39460
CERMAK J E 39691
CERNANSKY N P 38913
CHA F 39048
CHAHINIAN P *39841
CHAKRAVARTY S *39134
CHALMERS F S *39135
CHANG R C 39381, 39396
CHANGNON S A JR *39653, *39654, *39655, *39656, *39657
CHARNEY E 39831
CHE J 39048
CHECH I 39939
CHEN C *39842
CHEN J L 39125
CHEREMISINOFF P H *39729
CHERRY R H JR 39334
CHEW F D *38986
CHIBA A *39390
CHIEN H *39332
CHILTON C H *38898
CHISOLM J J 39895
CHOUDHURY S 39530
CHRETIEN J 39841
CHRISTIAN W J *39785
CHROSCIEL S *39619
CHRYSSANTHOU C 39790
CHU DER O 39988
CHUBB T W *39463
CHUONG B T *39391
CHYLEK P *39620
CIMINO J A 39787
CLARK R *39888
CLARKE A N *39796
CLARKSON T W 39894
CLAYTON G D *40153
CLOUGH P S 39233
COAKLEY J A JR 39620
COATES N H 39255
COFFIN D L *39889
COGHE A 39758
COHEN A A 39917
COLE W E *39136
COLLINS D C 39667
COLLINS R D *39559
COMPTON B *39527
CONDIFF D W 39779
CONDREN A J *38940
CONEY T A *39464
CONKLIN F S 40004
COOK J D 38921
COPELAND G G *39137
CORN M 40000
CORNELL C F *39138
CORRADINI C 39721
CORRIN M L 38961, *39699
COSTONIS A C *39995
COUGHLIN L L 39909
COUNDRAY P 39845
COVAN F 39787
COY D W 40015
CRAIG A B *39139
CRAIG J W T *39140
CREASON J P *39614
CREED E R *39953
CROKE E J *40120
CROKE K G 40007, 40100, 40120
CRONKITE E 39790
CROSS F L JR *39528, *40121
CROSS N L *39465
CUDDEBACK J E 39441
CURCHOD J M *39369
CURIE C *39933
CURRAN G P *39141, *39142
CURTIN C 39498
CWIECZEK E L 39328

D

D AURIA J M 39460
DABBERDT W F *39700
DALE J T 38854
DAM R 39413
DANIEL D J 39988
DANIELS A 40117
DATE N 39970
DAU H 38982
DAVIES C N *39574
DAWIDCZYNSKI P 38949
DAWSON R F 38940
DAY E G *39143, *39144
DE KONING H W 39431
DE VEER S M *39392
DE VOLO N B *39333
DE VRIES D M 39559
DEAN K C 39063
DECKER C E *39466
DECOUFLET J 39253
DEGUCHI Y *38987
DEHNEN W 39937
DEMARRAIS G A *39725
DEMENT J M 40022
DEMLER R *39145
DESCHAMPS A *39146
DETRIE J P *39621
DETTMER E *38988
DEURBROUCK A W *38989
DEZAEL C 39146
DI LUZIO N R 39803
DIAMANTIS A A *39730
DICK I 39572
DICKEY B R *39147
DIEHL E K 39275
DIETRICH H *38990
DIKUN P P *38966
DILUZIO N 39804
DIMOURO P *38899
DIMOV D 39932
DINGLE A N 39642
DINI D 39479
DODDS H 38899
DODGSON J *39467
DODO H 39823
DOERING R 39439, 39790
DOI M 39926
DOI S 39007
DOLEN J W JR 38992
DOLGNER R *39934
DOMKE C J 38866
DONALD G *39148
DOUREN L 38983
DOWNS D *39149
DOYLE G J 39786
DRAPER P *40098
DRAVID A N *39150
DRESSEL W M 39327
DRISCOLL J 39498, *39529
DRIVAS P J *39622
DUBOIS L 39393
DUNBAR J R 38985
DUNSKIY V F *39759
DUPOUX CLERC N 39782
DUPOUX J *38991
DUTU S *39890
DWORETZKY L H *38941

E

EAGAN M L *39393
EAGLEMAN J R 39697
EARDLEY R P 39195
EASTMOND R J 39697
EBERIUS K H *39760
ECKRICH W 39382
EDWARDS H W *38961, *39701, 39716, *39780, *40122
EFENDIEV T B *39151
EGERTON T A *39731
EHRENFELD J 39529
EHRING G 39847
EIBERWEISER H J 39403
EICHLER D 39160
EIJI H *39949
EISAMAN P R 38854
EISELE H 39160
EISENFELDER D J *38992
ELEC WORLD *39152
ELGAR K E 39559
ELIAS R J *40022
ELLIOTT D E *39153
ELLIOTT J F 39742
ELLISON A H *39394
ELLISTON J E 39559
ELLSAESSER H W *38942
ELO R *39891
EMOTO Y 39496
ENDO R *39797, 39822
ENDO T *38993, 39475, 39678
ENG S T 39440
ENGLAND C 39281
EREMIT L *39154
ESSENHIGH R H 39136
ETO H *38994
ETO T 39234
EVANS M J 39821
EYBL V *39843

F

FABER J H *39155
FALLER N *39986
FANCHER J R *38943
FARRAUTA R J 39078
FARRAUTO R J *39732
FASSETT D W *39892
FAVALE B 39721
FEHER M 39571

FEINBERG E B 40132
FEINENDEGEN L E 39915
FENSTERSTOCK J C *40123
FENTERS J D *39844
FERGUSON R C *39468
FERRARA R *39615, *39723
FERRI A *39156
FERRIS B G *39893
FETTERMAN D E 39079
FIELD D E 38878
FIELDHOUSE D J 39616
FILLER J C 40038
FINE M M 39327
FISCHER F 39373
FISCHER T E *39733
FISCHER W H *39658
FITE L E 39419
FLASSKAMP W 39346
FLEGAL C A 39002
FLEISCHER M *38944
FLETCHER R S 39202, *39355
FLUEGGE R A *39734
FOCK M *38850
FODOR G G *39935, *39936
FOKINA V D *40099
FOLZ J M *39395
FORBES R E 38964
FOSTER J F *38851, *39469
FOURCY A 39957
FOWLER D *39954
FREAR D S 39973
FREEMAN G 39821
FRENZEN P *39659
FREOUR P *39845
FRIE W *39761
FRIEDHOFF A J 39787
FRIEDMAN B M 38878
FRITZ J S *39396
FROST A C *38995
FUERST E 39356
FUHS A E 39757
FUJII K 39083, 39774
FUJII M *38852, *38853, *39586
FUJII N 38919
FUJII T 39410
FUJIMORI Y 39810
FUJIWARA K 39901
FUKAKUSA M 39031
FUKASE O 39924, 39925
FUKAYA K 39415
FUKUDA H 39582, *39955, *39956
FUKUDA I 39810
FUKUDA M 39924, 39925, 39994
FUKUI S 39415
FUKUOKA S *39623
FUKUSHIMA H 39412, *39470
FUKUYAMA T 39103
FULLER W R *39157
FURLONG D A 39293
FURST A 39852
FURUKAWA S *39158
FURUTA S *38996
FUSAMURA N *39397

G

GADOMSKI R R *38854
GAFFRON H 39775
GALE N L 38951
GANLEY J T *38855
GANSERT W 39160
GANTZEL P K 39560
GARREC J P *39957
GARRETT K *38997
GARVIN D *39762
GAST R A *39159
GATZ D F *39587, *39660
GAY E C 39228
GERHARDT G *38998
GELBWACHS J *39398
GENERALCZYK K 39337, 39338
GHELBERG N W *39724, *39939
GHEZZI U 39758
GHOSH R S *39530
GIARDINA P J 39211
GILES W H 38941
GILL S J 39818
GILLETTE M 39805
GIMBRONE A V 38854
GIVENS R L 38985
GLAENZER K *39735
GLOECKLER O *39160
GLORIA H R *39661
GLOWIAK B *40013
GLUECK A R *39161
GO F 39590
GODDARD W B 38985
GODEL A A *39162
GODIN J 39526
GOETZ V N *39736
GOLDBERG E D 39727
GOLDWATER L J *39894
GOLEC T 39180
GOMPF H *39163
GOODACRE C L *39846
GOODSEL A J *38999
GORGAN I 39939
GORIN E 39141, 39142
GOTO N *39575
GOTTMANN LUCKERATH I *39847
GOULDIN F C *39000
GOYER R A *39848, *39895
GRAF D 39021
GRANAT L *39702
GRANDJEAN P *39849
GRANT L O 38961, *39703
GRANT W B *39399
GREELEY R S *39164
GREEN W J 38854
GREGORY P H 40138
GRIBANOVA L M 39776
GRIGGS M 39426
GROBECKER A J *38900
GROBMAN J 39188
GROSH R C *39662
GROTH H C 38988
GRUPINSKI L *39165
GUESTEN H *39737
GUILBAULT G C *39471
GURTNER G H 39840
GUTKNECHT W F 39452
GUTMANIS I 40010
GUTSCHE B *39400

H

HAARER E *39356
HAAS J C 39280
HAAS M 39290
HAASE D J *39001
HABIB Y H 39729
HACKNEY J D *39850
HAGIWARA Y 38860
HAKE R D JR 39399
HALE B N 39784
HALES C H *40143
HALES J M *39763
HALLOWELL J B *39334
HAMANO K 39100
HAMERSMA J W *39002
HAMILTON W *39166
HAMM J R 39192, 39193, 39194
HAMMOND P B *39896
HAMPP R *39958, 40144
HAMPSON R F *39764
HANAI Y 39769
HANNA S R *39624, *39625, *39626
HANNAN P J 39573
HANNES K *39003
HANSEN H C *39004
HANSON K J 39648
HARA H 39030
HARADA A 39865, 39866
HARADA Y *39851
HARBOE H *39167
HARDISON L C *39168, *40006
HARDT L *39005
HARINGTON J S 39912
HARRISON D P 39081
HARRISON P R *39531
HARSHA P T 39781
HARTMAN L M 38961, 40017
HARTZ S 39909
HARUKI T 39600, 39825, 39826, 39827, 39828
HARVEY W 38917
HASEGAWA K *39169
HASEGAWA M *39401
HASEGAWA T 39493
HASEGAWA Y 39084
HASHIDA I *39006
HASHIMOTO T 39580
HASHIMOTO Y *39007, 39417
HASSELBLAD V 39917
HATANAKA H 39590
HAYAKAWA I 39589
HAYAKAWA S 39579, 39944
HAYASHI K 39473, 39833
HAYASHI M *39402
HAYASHI T *39008
HAYES W J JR *39897
HAYS G A *39357
HEAGLE A S *39972
HEAP M P 39771
HEATH R *39532
HEBERT R 39498
HEIDERSCHEIT L T 39614, 39917
HEIN J 39422
HEITLAND *39170
HEITNER K L 40146
HELFINSTINE R F 38968
HELLER J *39171
HELMENSTEIN S *38856
HENDERSON B E 39806
HENDERSON R E *38901, 38909
HENKEL H J *39009, *39172
HENSCHEL D B *39173
HERBOLSHEIMER R 39581
HERMANN J *39403
HERR G A *39010
HERREBAUT L *39404
HERRMANN E *39367
HERRMANN G *39765
HERRMANN R 39400
HERZOG H W JR *40014
HESSTVEDT E *39663
HEUSDEN S V *39405
HIDER S A 39269
HIGUCHI F 39820
HILL D C 39143, 39144
HINCHLIFFE L 39547
HINKLEY E D *39406
HINO M *39627
HINTENBERGER K *39898
HIRAMATSU K *39738
HIRANO S 39566
HIRAO O 39026
HIRAOKA M *39766
HIRASHIMA H 39943

HIROSHIMA H 39946, 39947
HIROTA M 38873
HIRST E *38902
HISADA S *39174
HISHIDA K *39588, *39589, *40037
HISHINUMA T 39101
HLAVKA G E 39718
HO W *39852
HOBBS P V 39635
HOCH I *40124
HODGE H C *39899
HODGESON J A 39437
HODGSON R H *39973
HOEKSTRA K E 39078
HOELL W *40144
HOELZEL W 39569
HOETH W 39561
HOFFMAN K *39175
HOFFMAN L *39011
HOFFMANN W *39176
HOGSTROM U *39664
HOJI H 39926
HOLDEMAN J D *39628, *39665
HOLDERNESS F H *39767
HOLLAENDER W *39407
HOLLOWELL C D 39480, *39533
HOLMA B 39849
HOLMES R F 39538
HOLZHEY P 39903
HOMOLYA J B *39534
HONDA T 38875, 39054, 39485, 39486
HONMA K *39408, *39409
HONMA Y 38873
HOOD D *39177
HOOT T G *39666
HORDYNSKA S *39993
HORIUCHI H *39798
HORIUCHI K 39946, 39947
HORIUCHI N 39746
HOROWITZ A *39667
HORTON R J M *39900
HOSENFELD J M 39801
HOSHIKA Y 39501
HOSHINI S *38857
HOSHINO M 39611
HOSHO Y *39178
HOSOKAWA S 39810
HOUSE P W 40091
HOWARD P *39799
HUCHO W H *39179
HUEBNER G J JR *39180
HUFF F A *39472, 39656, *39668, *39669, *39670, *39671
HUGHES L 39240
HURTER D *39181
HUSZAGH D W 39439
HUTTON A E 39129
HYCNAR J *39335
HYSELL D K *39800

I

IIDA A *39012
IIDA T 39100
IIJIMA T *39182, *39959
IINOYA K *39336
IIRI S 39580
IKEBE Y 39444, 39473, *39535
IKEDA H *38858
IKEDA K 39589
IKEDA N 39739
IKEDA Y 39766
IKEGAMI M 39541, 39682
IKEMORI K *39183
IMAGAWA T 39766
IMAI T 39977, 39978, 39979
IMAMURA K *39410, 39590
IMATANI H *38859
IMPENS R *39974
INABA H *39013
INABA M *39014
INGALLS M N *38903
INGEBO R D *39184
INOUE H 39261
INOUE I *40028
INOUE J *39185
INOUE K 38974, *39015, *39590, 39951
INUKAI T 38987
IONESCU V C *39358
IOOS E *39359
IRIE T 39025
ISAHAYA N *39016
ISHIDA K 39535
ISHIGURO A *39473
ISHIGURO T *39017, 39412, 39470, 39493
ISHII S 39810
ISHIKAWA S 39553, *39672, 39685, 39705
ISHIYAMA E 39874
ISHIZAKA T *40145
ISONO N *39901
ITAYA K 39611
ITO A *39186
ITO J 39999
ITO K *39018
ITO M *39768
ITO N 39579
ITO T *39769
IWABUCHI B *39019
IWAMATSU Y *39411
IWAMIYA Y 39487
IWASAKI T *38860
IWASAKI Y *39412, 39470
IZUMI N 39594
IZUMI T *39591
IZUMIDA S 39963, 39964
IZUMO N 39595
IZYCKI J 39920

J

JACOBS E S 39330
JAENIKE K *39187
JAHNIG C E 39040
JANSSENS M *39413
JANUSZEWICZ I 38945
JANZ H 39003
JEANES M J 39743
JENKINS D M 38851
JENNETT J C 38951
JENSEN E 39004
JEWELL W J 38940
JIENESCU Z 39890
JIMESON R M 38898
JO S H 38893
JOATTON R *39474
JOHNSON D E *39801
JOHNSON J L *39414
JOHNSON W B 39700
JOHNSTON H S *39673
JONES D M A *39674, *39675
JONES R E *39188
JONKE A A 39290
JORDAN K 39346
JOSLIN J C *38861
JOYCE J M 39452
JUDA J 39619
JUGEL W 39263, 39299
JUSKO W J 39909
JUST J *39902
JUST T 39482, 39760

K

KABSCH P 40013
KACHI H 39769
KADEL H P *39020
KADOWAKI S 39768, 39768
KADOYA N 39623
KAHL D *39021
KAINDL F *39903
KAJIYAMA T 39948
KAKIZAKI M 39496
KALPAZANOV Y *39629
KALTREIDER H B *39853
KAMINSKI S 38945
KANAZAWA I 39682
KANDA M 39705
KANEDA K 39867
KANEDA M 39672, 39685
KANEFUJI K 39158
KANEKO F *39904
KANEKO M *38904
KANEKO T *38862
KANEKO Y *39022, 39942
KANEMATSU M 39592
KANEMATSU S *39023
KANNO S 39415
KANO F *39975
KANT F *39189
KAPCZYNSKI J *39337, *39338
KAPISH J 39805
KAPPLER G 38894
KARIMATA Y 39802
KASAHARA K *39024
KASHIKI M *39739
KASHIWAGI H *39802, *39854
KASHIWAYAMA S *39025
KASPEREK K 39915
KASPRZYCKI A *39536, *39676
KASSNER J L JR *39784
KASUYAMA T 39950
KATAGIRI Y *39415
KATEN P C 39712
KATO H *39855, 39874
KATO K *40029
KATO T *39026, 39411, *39576, 39769
KATSURA E 39943
KATSUYA A *40139
KATZ J L *39630
KAUL K 39362
KAUPERT A *39190, *39191
KAWAI K 39856
KAWAJIRI Y 39976
KAWAKAMI M 39579
KAWAMOTO C *38905
KAWANO T *39027
KAWARAYA T 39600, 39825, 39826, 39827, 39828
KAWASAKI G 38910
KAWAZOE K 39943
KEAIRNS D L 39125, *39192, *39193, *39194, 39229, 39235
KEDDIE A W C *38906
KELLEY J J *39416
KENNEDY A S *40007, *40100, 40120
KENNERLEY R A *39195
KERN W 38972
KETCHAM B T 40123
KICE R W *39028
KIDO S 39812
KIKUCHI H *39677
KIKUCHI K 39491, 39570, *39678
KIKUCHI M 39045
KILBURN K H *39905, 39910
KIM L 39048
KIMBALL D *39196
KIMURA M *39906

KINOSHITA Y 39943
KIRSCH H 38848
KIRSCHNER A 39267
KISHI H *39417
KITAGAWA T *39631
KITAMOTO A *39632
KITAMURA F *39976
KITAMURA N *39950, 39951
KITAMURA S 39586
KITAMURA T *39592
KITAMURA Y *39943
KITO M *39197
KITTLE W F 39235
KITTRELL J R 39736
KIUCHI S *39029
KLEIN F *40038
KLEIN H J 39915
KLEIN J 39439
KLEINERMAN J *39907
KLEVANSKII V M 39076
KLIMISCH H J *39537
KLYE M L 39228
KNAPP H 39265
KNEIP T J 39787
KNOX J B *39633
KNUTH R 39547
KOBAYASHI G 39602
KOBAYASHI H *39475
KOBAYASHI K 39045
KOBAYASHI M *39030
KOBE R *39031
KOCH C 39172
KOCHETKOVA T A 39887
KODAMA J *39951
KOERBEL W *39032
KOGAI M K *39476
KOGAN Y I *39562
KOGLIN W *39033
KOIDE M 39727
KOIKE K 39501, 39944
KOJIMA I 39501
KOLB W *39593
KOLBOW P 39563
KONDO H 39810
KONDO M 39586, 39592, 39611
KONDO S 39592
KONDO T 39940
KONDRATEV V Y 39863
KONO H 39686
KORMANYOS K *39198
KOROSY L 39135
KOSAKA H 39497
KOSHI S 39856
KOSTKA H 39172
KOTLER V R 39151
KOUTSANDREAS J D *39538
KOVYGIN G F *39634
KOWADA S 39746
KOWALISZYN D 39989
KOZAK J H 39431
KRAFT M L 39002
KRAH W 39362
KRASNITSKAYA N D 38966
KREEGER A *39199
KREJCI M *39418
KROMM D E *40140
KROON D J 39405
KRUECKEBERG D A *40125
KRUG H *38863
KRUGERS J F J *39477
KRUGMAN L I 39562
KRZYSZTOFIK B *38945
KUBOTA S 39680, 39741
KUBOTA T *39034, *40039
KUCHAK Y A *38864
KUDO S 39859
KUEHN P 39003
KUHLMANN P *39200
KUHN J K 38968
KUHRE C J 39150
KUMAGAYA T *38865, 39963, 39964
KUNII K 39963, 39964
KUNITSCH G 39888
KUNSELMAN P *38866
KUNZ W G JR 39330
KURCHATOVA G 39629
KURIHARA S 39970
KURITA H 39865
KURIYA T 39810
KUROSAWA K *39035
KUROSE T 39234
KURTZWEG J *40126
KUSAKA S *39977, *39978, *39979
KUSUMOTO S 39842
KUYKENDALL W E JR *39479
KUZNETSOV V I 39863
KYONO Y *39856

L

LABO J A *39478
LAGRONE F S 39331
LAHAYE J *39740
LAITINEN H A *39908
LAJOS T 39067
LAMBERT J L *39420
LAND G W 39036
LARSEN R I *40023
LARSH R N 39997
LARSON D H *39201
LAUDE L S 39770
LAUFF H P *39375
LAYFIELD L J 39819
LEAL O 39728
LEAR W 39177
LEASEBURGE E *39421
LEDERMAN S *39539
LEE A A 39002
LEE N *40142
LEE R E 38941
LEE R E JR *39422
LEE S C *39781
LEFEBVRE A H *39202
LEFEVRE H *39203
LEGATOWA B 39993
LEH F 39809
LEIPPER D F *39679
LEMEZIS S *39036
LEMOINE J *38962
LENDZIAN K 39958
LENTZ P E *39803, *39804
LEONARDOS G *39423
LEPOW M L *39805
LERCHE H *39960
LERSNER H F V *40040
LESER R J *39540
LEVITINA E G 38966
LEWIS G P *39909
LEWIS L 39203
LEWIS P S 39272
LIBERI V E 39330
LIES K H 38850
LIEVENS F *39424
LIGEON E 39957
LILIE R H *40024
LILJEDAHL D R *38907
LIN C L 39781
LINDBERG J D *39770
LINDE R V *39204
LINDSAY R *39205
LIPKOVA V 39791
LIST R J 39708
LISTON E M 39399
LJUNGGREN K 39554
LJUNGSTROM *39206
LOCATELLI J D *39635
LOCKE H B 39208
LOFFLER F *39037
LORD W H *39207
LOVELL H L *39372
LOVELOCK J E *39577
LOWE D C *39578
LOWES T M 38869, *39771
LUCCHESINI M *39479
LUCERO D P *39425
LUCHESI M *39370
LUDWIG C B *39426, *39772
LUDWIG F L 39700
LUNN H G *39208
LUTZ G J *39427

M

MAATTA K 39891
MACFARLANE J J 39767
MACHI S *39038
MACHIDA C 39487
MACK D A *39480
MACKINGER H *39039
MACKLEM P *39910
MADDALONE R F *39428
MADELAINE G 39429
MADELAINE G I *39782
MADELAINE G J 39404
MAEDA H 39994
MAGEE E M *39040
MAGONO O 39475, *39680
MAHLMAN J D *39704
MAIGETTER R Z 39844
MAIGNE J P *39429
MAJ U *39609, *39610
MAKIHARA T 39812
MAKINO K 39336
MAKINO S *39857
MALKIMAN V I 39776
MALKMUS W 39426, 39772
MALLET J R 39845
MAMAYEVA A A 39830
MANABE S 39704
MANAEVA L N 39776
MANN D E *39041
MANOWITZ B 39649
MARINELLI J L *39042
MARKOWITZ S 39805
MARKS R E *39043
MARSHALL R L 39047
MARTIN B E 39437
MARTIN F 38856
MARUOKA Y *39209
MARUYAMA M 39045
MASON H F 40131
MASSOTH F E 39091
MASUDA H 39336
MASUDA N 39158
MASUMOTO S 39158
MATSUBARA K 38873
MATSUDA H 39943
MATSUHAMA M 39774
MATSUI T 39579
MATSUMOTO H *39594, *39595
MATSUMOTO K 39623
MATSUMOTO S 39594, 39595
MATSUMOTO Y *38867
MATSUMURA I *39481
MATSUNO T *39773
MATSUOKA A 39182
MATSUOKA Y 39182
MATSUSHIMA J *39980, *39981, *39987
MATSUSHITA M *39210

MATTESON M J *39211
MATTHEWS C W *39212
MAURER O *39563, *39565
MAX E 39440
MAYER GUERR W 38877
MCADAMS H T 38866
MCCOY J 39529
MCCOYD G C 38967
MCENTIRE B R *39213
MCFADDEN J J *39214
MCINTIRE M S 39789
MCJONES R W *39215
MCKENNA J D *40015
MCLAUGHLIN R D 39480
MCMANUS T T 39809
MCNULTY O 39614
MEGAW W J *39681
MEIJER R J *39371
MEIKIS G 38894
MEINEL H *39482
MEISEL W S 39667
MENCK H R *39806
MENZIES R T *39430
MERCKLE K E *39339
MERONEY R N 39666
MERTEN U *39560
MERTL F 39843
MEYER R J 39217
MEYERS P A 39447
MEYERS R A 39002
MEYERS S *40041
MICHAEL B *39216
MICHAEL P *39722
MICHEL B *38868
MICHELFELDER S *38869, 39771
MICHELS A P J *39217
MIHORI S *39044
MIKAMI R *39858, *39859
MIKI S 39944
MIKSHICH J *39911
MILES C D *39988
MILFORD N *38967
MILHAM S JR *39807
MILLER G W 39968
MILLER K *39431, *39912
MILLER L 38917
MILLER P R 39997
MILLER R 39800
MILLER W E *39218
MILLETT L F 39421
MIMURA Y 39458
MINAMI Y 39101
MINNICK L J *39219
MIRABEL P 39630
MIROSHNIKOVA A T 39961
MISAKI M *39541, *39682
MITAMURA T *39045
MITANI K *39611
MITCHELL B R 39091
MITCHELL H R 39159
MITRA S K *38908
MITSUOKA K 39485
MITSUZAWA Y 39754
MITTELSTRASS M 39088
MIURA M *39220
MIYABE H *39340
MIYAJI K 39802
MIYAKAWA S 39048
MIYAKAWA T *38870
MIYAMOTO A 39857
MIYAMOTO T *39596
MIYANAMI K *39221
MIYAO M 39943
MIYASAKA M *39860
MIYATA T 39810
MIYAZAKI I *40042
MIYAZAKI S 39810
MIYZAKI S *39222
MIZOBUCHI I *38871
MIZUKAMI Y *39597
MIZUNO T 39016
MIZUTA H *39483
MIZUTANI 39579
MIZUTANI M 39686
MIZUUCHI A 39270
MOGI T 39623
MOORE D O JR *39046
MOORE W JR 39800
MORAN J B *39808
MORAN S A 39697
MORGAN G M JR 39461, *39683, *39684
MORGENSTERN W 39433
MORI C 39945
MORI K 38919
MORI M 39397
MORI Y 39627, 39810
MORIKAWA M *39566
MORITA T *39223
MORITA Y 39553, 39672, *39685, *39705
MORITO F 39810
MORIUCHI M 39942
MORRALL J W *39224
MORRIS J P 39125
MORRIS R B 38878
MORRISON G H *39542
MORROW P E *39913
MORTON D J *39616
MORTON H L *39047
MOSIER S A *38909
MOSS G 39140, *39225
MOTOMIYA T 39833
MOTSCH P 40038
MUCKLI *40043
MUDD J B *39809
MUHR W 39037
MULCHANDANI H K 39134
MUN F *39048
MUNKELWITZ H R 39649
MURAKAMI S *39810
MURAMATSU M 39496
MURAMATSU S *40044
MURAMOTO N *39049
MURASE A *40025, *40045
MURATA M *39579
MURPHY E F *40127
MURRAY C P F V *39861
MURRAY F W 39745
MUZIO L J 38888
MYERS M L *40008
MYERS S *40046
MYLES K M 39228

N

NAGAI H *39944, *39945
NAGAKURA H *38872
NAGAMI H 39945
NAGANO J *39862
NAGAOKA S 39797, *39811, 39822
NAGASAKA J 39705
NAGATA I *39812
NAGATA K *38873, *39050, *39226
NAGATA Y 39493
NAGDA N L 40011
NAGUMO K *38874
NAITO H 39623
NAKAGAWA S *39941
NAKAI Y *39051
NAKAJIMA F 39741
NAKAJIMA T 39842
NAKAMOTO M *39052
NAKAMURA K 39940
NAKAMURA M 39497
NAKAMURA T 39397
NAKANO M *39636, *39686, *40101
NAKANO T 39686
NAKAYAMA S 39576
NAKAZAWA I 39541
NARITA S *39227
NARVAEZ G M 39861
NASH 39383
NASON A P 39916
NAUNDORF W 38863
NEAL R A 39897
NEEB R *39432
NEEDLEMAN H L *39813
NEIS H 39581
NELSON A W *39484
NELSON P A *39228
NEMOTO T 38893
NEUFELDER M 38868
NEVINS J L 39294
NEWBY R A 39192, 39193, *39229
NEWMAN L 39439, 39790
NICKLIN T *39230, *39231, *39232, *39233
NIEDERBERGER M 39903
NIHEI H 39589
NIKI H 39751
NIKOLAYEVSKIY V S *39961
NILSSON G A *39053
NISBET I C T *39706
NISHIDA K *38875, *39054, *39341, *39485, *39486
NISHIMOTO K *39234
NISHIMURA M 39006
NISHIMURA Y *39741
NISHINO S *38910
NISHIO M 39926
NISHIYAMA M 39458
NISHIZAWA Y *38876
NISHKAWA Y 39590
NIWA T 39027
NOBLE S 38892
NOGUCHI I 39158
NONAT A 39391
NORDIN FOSSUM G *39055
NORGREN C T 39184
NORLUND G *39687
NOSE K *39914
NOSE Y *39814
NOSO S *39056
NOVAKOV T 39240
NOVOSELOV V I *39863
NOVOZHILOVA D V 39562

O

O DONNELL J J 39046
O NEILL E P 39192, 39193, *39235
OBANA T *39057
OBERDORFER P E *39236
OBERLIN J C 39957
OBLAENDER W *39433
ODAIRA T *39598
ODDS D J H *39237
OELERT H H *38877
OGANESYAN T A 39887
OGASAWARA M 39083, *39774
OGAWA M 39052
OGIHARA A 39820
OGURA T 39592
OGURI H 39623
OGURI T 39103
OHI G *39994
OHIRA M *39864
OHIRA T 39015, 39412, *39434, 39470, 39623
OIKAWA K 39417
OKA K 39590
OKA M 39827, 39904, 39924, 39925

OKA T *39058
OKADA H *39059
OKADA K 39810
OKADA T 39942
OKAMOTO M *39580, 39580
OKAMURA K *39946, *39947
OKITSU K 38858
OKUDA R 39945
OKUMURA H 38910
OKUTANI H *39865, *39866
OLESOVA A L 39776
OMICHI S 39623
ONO C *39060
ONO S 39812
ONOZUKA H 39412, 39470
OPPENHEIM A K 38913
ORTEGREN L G *39238
ORTEGREN L G H 38984
ORTH K H *39239
OSAKA T 39496
OSHIMA H 39261
OSHIMA S *39487, 39739, *39815
OSHINA T *39867
OSHIO Y 39874
OSTROWSKI A C *39707
OTA T 39946, 39947
OTOSHI T 39417
OTSUKA T *39435
OUELLETTE R P *39543
OVARD J C *39061
OVERBEY J W H 39543
OVEREND J 39748
OXLEY J H 38851
OYA H 39812
OYAGI S *39868
OZAWA K 39942

P

PACK D H *39708
PADY S M *40138
PAGNI P J *39240
PAI B R 38869, 39771
PALJUG J W 39425
PALMER H B *38911
PALUCH J 38947
PALUMBO P *39241
PANGBORN J *39242
PAPAYANNOPOULOS A G *39243
PARISOT J 38962
PARKER J 38906, *39544
PARKER W J *39637
PARRISH R W 38978
PASCHINGER H *39775
PASCHINGER J 39775
PASEK B 39142
PASINI S 39758
PASTERNACK B S 39787
PATRICIOS N N *40047
PAVLU J 39442
PELL M 39142
PELTON A D *39742
PENKETT S A 39577
PENZHORN R D 39737
PEPPERL H *39360
PERVIER J W *38878
PETERKA J A 39666
PETERS B *39062
PETERSEN H H *39244
PETERSON J E *39869
PETRICK D 39561
PETROLL J *39245
PETROV N M *39776
PETZOW G *39816
PHILLIPS C R 39753
PICKNETT R G 39465
PIERSON W R 39385
PIETSCH W *39246
PIGACHE P G *39379
PIGOTT P G *39063
PIJPERS F W *39064
PIKE R W 39081
PIKON J *39709, *39710
PITTS J N JR 39661
PLATELL O *39247
PLATOU J S *39248
PLUMMER P L M 39784
PLUNGIS D *39065, *39249, *39250, *39251
POHL D 39436
POHL K M *39066
POPOV V A *38912
POPPOFF I *39545
PORTER F D *40001
POTT F *39612, *39937
PRADEL I 39782
PRADO G 39740
PREINING O *40002
PRESZLER L *39067
PRINCIPLE P P 39280
PROBALD F 40140
PROCTOR E K JR 39399
PROMYSLOVA A D *39817
PROSPERO J M 39648
PRUGGMAYER D 38868
PRUPPACHER H S *39711
PSENAK M 39968
PURUSHOTHAMAN K 38951
PUSCHMANN G *39252
PUSTINGER J V *39488
PUTNAM A A *39068

Q

QUANE D E *39069
QUARLES J *40926, *40048, *40049, *40050, *40051, *40052, *40053, *40054, *40055, *40056, *40057, *40058, *40059, *40060, *40061, *40062, *40063, *40064, *40065, *40066, *40067, *40068, *40069, *40070, *40071, *40072, *40073, *40074, *40075, *40076, *40077, *40078, *40079, *40080, *40081, *40082, *40083, *40084, *40095,
QUIG R H *39070
QUILLEVERE A *39253

R

RABIN R *39546
RAGGIO D G *39254
RAMPON H *39567
RANFT E L 39143, 39144
RANTY A 40038
RASCH R *38879, *38880
RATH R *39436
RAUSCHENBERGER H 39005
RAY G F *38946
RAYNOR G S 39722
REARDON J E 39772
REES O W *38968
REGAN L A 39973
REGENER V H *39638
REGISTER J W 39801
REHME K A *39437
REINER R 38899
REINISCH R F 39661
REISENWEBER R L 40007, 40100
REISMAN J I 39061
REITER E R 38961, *39712
REITZ R J 38854
REMMERS K *39376
RENARD B *39342, *40128
RENAULT P 39146
RENNER R 39296
REPINA R S 39562
RHYNE B C 39848
RICE R L *39255
RICKS G R *39962
RIDKER R G 40014, *40016, *40129
RIEDIGER G *39438
RIETHMANN H *39071
RIGO H G *39777
RIHA J 39290
RIMBERG D *39547
ROBBINS R C 39399
ROBERTS A G 39208
ROBERTS F S *38963
ROBERTS G H 38906
ROBERTS R 38909
ROBERTSON C A M *38881
ROBERTSON W M *39256
ROBSON F L *39257, 39273
ROCCHETTI G 39721
ROHLIK H 39171
ROLLINSON A M 40143
ROMANO A J *39439
ROMELL D *39258
ROSENBERG H *39259
ROSENBERG H S 38851
ROSENGREN L G *39440
ROSS H U *39378
ROSS R A *39743
ROSS S S *39260
ROSSON J L *39072
ROY D K 39530
ROYAL T M 39466
RUBIN E S *39639
RUBINO R A 39805
RUDOLPH S A *39818
RUEHL W 39360
RUMLER F *39581
RUSAK V M 39076
RUTKOWSKI J D *39713
RYSZKA E *39548
RZEKIECKI R 39380

S

SABUROV I S 39076
SAEKI M *39489, *39963, *39964
SAEKI S 39101
SAENDIG R 39599, *39599
SAEUFFERER H *39361
SAGAWA Y 39862
SAIG E *40017
SAIKI K *39261
SAIKI Y 39623
SAKAI K *39490
SAKAKURA Y *39870
SAKANO T 39084
SAKURADA T *39073
SAKURANE Y 39946, 39947
SALEEM A 39135
SALTZMAN B E *39441
SALZENSTEIN M A *40130
SALZMAN J A 39464, 39540
SAMEJIMA Y 39182
SAMSAHL K 39442
SANDSTEAD H H 39897
SANO H *39744
SANO S 39952, 39967
SANO U 39589
SANTIAGO A *39262, *39343
SANTIAGO E 39262, 39343
SARNA M *39344
SAROCHINSKAYA L S 38966
SAROFIM A F 39706
SAROSIEK J *39989

SATAKE T 39862
SATO C 39810
SATO H 39867
SATO M 39686
SATO S *39570, 39591
SAUCEDA F M 39861
SAUNDERS P J W 40142
SAWANAKA K 39971
SAWYER R F *38913
SAYERS A J 39787
SAYRE J W 39831
SCANLON J H 38967
SCHAEFER H *38914
SCHELL W R 39696
SCHERTZ W W 39228
SCHICHA H *39915
SCHICKEDANZ P T *39688
SCHILLING H D *38882
SCHLESSMAN E E JR 39669
SCHLIPKOETER H *39871
SCHLUEP H *39074
SCHLUMBOHM H 38850
SCHMIDT F *39263
SCHNARE P D 39988
SCHNELLE K B JR 39617
SCHOENHERR D 38863
SCHOERMANN J 39407
SCHOPF P S *39345
SCHRAMEL P *39442
SCHRODT J T *38915
SCHROEDER H A *39916
SCHUELZKE P 39160
SCHULEK E *39571
SCHULTZ G R 39780
SCHULZ R *39264
SCHURATH U 39645
SCHWARTZ R *39265
SCHWARTZ W A 38878
SEALS R K JR 39388
SEBESTYEN T M *39266
SEE J B 39742
SEERY D J 38911
SEIFF H E *39872
SEKI H 39994
SEKI S 39829
SEKIDO T 39101
SEKIUCHI T *39491
SEM G J *39492
SEMONIN R G 39662, *39689, *39690
SENDA I 38910
SERISE M 39845
SETHURAMAN S *39691
SETO M 39874
SETO T 38974
SEVERINETS G N 38966
SEVERNE B C *39965
SHAH I *39267
SHAH I S *39075, *39268
SHAIKHUTDINOV A M *39076
SHAIKINUROVA L F 39076
SHAIR F H 39622, 40143, *40146
SHAPIRO I M 39813
SHAW D A 39488
SHAW H 39040
SHENDRIKAR A D 39428
SHERMAN P L 39488
SHERWIN R P *39819
SHIBAHARA H 39261
SHIBUYA M *39443
SHICK P E *39269
SHIEH J 39968
SHIGA M 39182
SHIGETA Y *39493
SHIMA H 39579
SHIMIZU H *39270
SHIMO M *39444, 39473
SHIMOGATA S *39640
SHIMP N F 38968
SHINGO Y 39052
SHINRA K *39271
SHIRAKI K 38987
SHIRASAWA T *39077
SHISHIDO M *39820
SHITAMUDE H 39030
SHOFFSTALL D R 39201
SHORE R E 39787
SHOUP R D *39078
SHUBIK P *39873
SHULTZ F G *39272
SHUMATE M S 39430
SHY C M *39917
SIBBETT D J *39494
SIDOROVA N V 39887
SIEGEL R D 39355
SIEKIERZYNSKA H *38947
SIMON C 38941
SIMON R *39377
SIMON W *39568
SIMS A L 39472
SINGER E 39160
SINGH J 39530
SINHA J K *38916
SIREC A 39932
SIS L B 39080
SKELLY J M 39969
SKINNER F W *38917
SKOFF R 39213
SKOGERBOE R K 38961, *39549
SLAPPEY G A 39294
SLOAN M F 39821
SMALE J R *39273
SMALL W J *39079
SMITH F A 39899
SMITH I W M 39735
SMITH J R 39192, 39193
SMITH M R *38964
SMITH R D *39445
SMITH R G *39918
SMITHSON G R JR 39334
SMOKOTNINA T N *38969
SMOLYAR V I *39919
SNEERINGER P V *39550
SNIDER M A 40007
SNYDER A D 39488
SOEJIMA K 39802
SOELL W 39160
SOLOMON L H *40131
SONDIC M 39932
SONE H 39491
SOOD A 39736
SORENSON S C *39080
SPAETH M E 39129
SPARROW G J 39730
SPEICH P *38918
SPRINGER G S 38855
SPURNY K *39446
SQUIRES R *38948
ST JOHN D A 39195
STACHLEWSKA BERNADT B *39714
STADLER L 39537
STANILEWICZ W *38949
STARA J F 39800
STARLIPER A G 39327
STASKEVICH N L 38966
STASTNY E P *39274
STAUFFER D *39641
STEDMAN D H *39447
STEENKEN F *39982
STEIGLEDER G K 39847
STEIN A *38883
STEIN A M *39745
STENBACK F 39873
STEPHENS R J *39821
STERN A C *39448
STEUNENBERG R K 39228
STEWART A *40148
STEWART J T *39275
STEWART R D 39869
STINNETT S J *39081
STOEBER W 39446
STOKES M A *39276
STONE F S 39731
STOREBO P B *39642
STORP K *39362
STOUT B G *39363
STREHLOW C 39787
STREHLOW C D 39792
STRICKLER S J 39747
STRONG T 39807
STROSZEJN G 39920
STUARD J D 39331
STUFFKEN J *39082
STUKEL J J 39750
STUMPP G 39265
SUETAKA T *39277, *39278, 39303
SUGAI R 39867
SUGAWARA K 39640
SUGITA K 39820
SUGITA M 39829
SUGIYAMA K *39966
SULKOWSKI W *39920
SULLIVAN J G 39745
SUMINOTO T 39594, 39595
SUTER T *40085
SUZUKI I 39623
SUZUKI S *38919, 39234, *39746, 39812
SUZUKI T *39822, 39874
SUZUKI Y 39496
SVERDRUP E F *39279
SWANSON D H 39614
SWANSON H R 39973
SYKES J A JR 39150
SYKORA J 39843
SZABO E V 39172
SZUBINSKI W W 38988

T

TACHIKAWA M 39999
TAFEL V *38970
TAGAYA S 39948
TAGUCHI K 39590
TAHARA E 39851
TAIKI DENKI KENKYU PROC S 39677
TAIRA K 39591
TAJIMA F 39812
TAJIMA N 39590
TAKADA M 39497, 39944
TAKAGI T *39083, 39774
TAKAGI Y 39103, 39487
TAKAHASHI K 39976
TAKAHASHI T *38884, 39802, 39854
TAKAI T 39946, 39947
TAKASHIMA A *39084
TAKASHIMA Y 39632
TAKAYAMA O *39874
TAKEDA K 39592
TAKEMOTO K *39875
TAKENAKA Z 39944
TAKEUCHI M 39052
TAKEUCHI N 39493
TAKIJIMA T 39862
TANAKA H 39458
TANAKA M *39823, 39926
TANIGUCHI T 39012
TANIYAMA T 39952, *39967, 39971, *39990
TAODA H *39983
TAPPENDEN T A 39131
TAPPI J *39449
TATAIAH K *38920

TATEN T 39473
TAVES E 39831
TAWA K *39085
TAYLOR J H 39140
TAYLOR W C *39280
TEDER A 39055
TEIXEIRA D P *39281, 39283, 39333
TEMPLE PEDIANI R W *39282
TEPPER L B *39551, *39921
TER HAAR G *39824
TERAKADO K *39582, 39955, 39956
TESARIK K 39418
TESSIER J F 39845
THAYER S D 38891, *38921, *38922, *38923, *38924
THOMPSON K C *39450
THOMPSON R E *39283, 39333
THOMSON J A L 39772
THORTON I 39792
THUR G M *39284, *39285
TILLERY J B 39801
TILLERY M I *39552
TIPTON I H 39916
TISDALL D E 39225
TISDALL D S 39140
TOBE M 39496
TOI C 39943
TOKANEHARA S *39948
TOKUNAGA M 39810
TOKUSHIMA Y *39999
TOMINAGA Y 39596, 39601, 39602
TOMITA K *39600, *39825, *39826, *39827, *39828
TOMMERDAHL J B 39466
TOMURA H 39944
TON C S 39925
TONNA G 39615, 39721, 39723
TONO I *39286
TORIYAMA T *39553
TOROPOVA T P *39692
TOWER P W 39757
TOYAMA A *39086
TOYAMA T *39940
TRAIN R *40086
TRAIN R E *40087, *40088, *40089, *40090
TRENKLER H *39087
TREVINO G *39715
TROE J 39735
TROMMER D 38863
TROTH D L *39287
TRUETT J B 39011
TSANG P *39495
TSUBOTA Y 39842
TSUCHIYA H 39611
TSUCHIYA K *39829
TSUDA T 39169
TSUJI K *39496
TSUJI M *39288
TSUJI T 38875
TSUJIMOTO Y 39304
TSUJINO Y 39590
TSUKUI K 38987
TSUNEHIRO Y 40039
TSUNOWAKI K 39501
TSURITANI T *39289
TURPIN P Y 39429
TWARDA B 39989

U

UCHINO M 39030
UEDA S *39876
UHLIK D J 39988
UKSILA E 39891
ULRICH R *39088
UMEDA M 39797
UMETANI Y 39026
UMEZAWA T 39829
UNSWORTH M H 39954
USUI T 39944
UTAGAWA M 39623
UTSUMI J 39942
UTSUMI K 39810
UZHDAVINI E R *39830

V

VAITKUS D R *39716
VALDEZ E G 39063
VAN LOOKEREN CAMPAGNE N 39064
VASILYEVA Y V 39886
VAUGHAN R D 39219
VERDOUW A J 39287
VERKAMP F J 39287
VERSCHUEREN K *39693
VESELY V *39089
VICKERMAN J C 39731
VICKERS P T *39368
VIDAL J 38962
VIDT E J 39125, 39229
VIEHRIG J *39090
VIGLA D 39782
VIKESLAND J P *39747
VIRARAGHAVAN T *40102
VIRR M J 39153
VISSERS D R 39228
VOGEL G J *39290
VOGEL H E *40147
VOGEL R F *39091
VON LINDE L 39204
VOSTAL J J *39831
VRANOS A *38885
VULLIAMY N M F *39291

W

WACKERNAGEL R *39292
WADA H 39944, 39945
WADE G L *39293
WADE R C 39494
WAGNER C 39180
WAHDAT F 39432
WAINERDI R E 39419
WAITZMAN D A *39294
WAKIZAKA I *39832
WAL J F V D *39451
WALDMAN C H 38888
WALKENHORST W *39092
WALKER D G 39001
WALL G 40140, *40141
WALLIN S *39295
WALLIS W J *39968
WALSH M P 40123
WALTER R L *39452
WALTON J J *39694
WANG V K *39748
WANGER H *39093
WANTA R C *39717
WARTENBERT H M 39005
WASILEWSKA J 39709, 39710
WATANABE H *39497
WATANABE S *39094
WATANABE T 39596, *39601, *39602, 39952, 39967
WATANABE Y 39304
WATARI S *39749
WATERMAN T E 39785
WATSON W D JR *40018
WEBB J S 39792
WEBER 40043
WEBSTER B D *39996
WEBSTER D S 39228
WECK L 39362
WEDDING B 39732
WEDDING J B *39750
WEEKS N E 39229
WEIDINGER J *39561
WEISS B 38895
WELCH W R *39922
WEN Y 39197
WENSTROM M *39296
WERT S L *39997
WEST P J *38886
WEST P W 39428
WESTERMARK T *39554
WETZELS F J 39082
WHITE H J *39095
WHITMYER A *39297, *39298
WHITTAKER W 39467
WHITTEN G 39673
WICKSTROM G V 38939
WIEMANN H J *39299
WIENS R E 39420
WILBER C G 38961, 39922
WILDEMAN T R *38887
WILDPANER V 39641
WILKES J O 39763
WILKNISS P E 39573
WILL J B *39969
WILLEMSEN F *39096
WILLIAMS A L 39633
WILLIAMS C G *39300
WILLIAMS D *39498
WILLIAMS E R *40091
WILLIAMS K R *38950
WILLIAMS M 38866
WILLIAMS M R *39301
WILLIAMS R J H 39962
WILLIS B H 40132
WILLIS R D 39452
WILM D *39346
WILSON D J 39796
WILSON J L 39205
WILSON K W *39786
WILSON R P JR *38888
WILSON W E *39097
WILT C R *39098
WINCHESTER J W *38889
WINNEKE G 39935
WIRTZ G P 39080
WIXSON B G *38951
WOJCIECHOWSKI J *39783
WOLBACH D C *39453
WOLF P C *39454
WOOD B *39364
WOOTTON A G *39099
WRIGHT S J *39302
WRONKIEWICZ S C 39080
WU C H *39751
WYATT J P *39923

Y

YAGI A 39945
YAGYU H 39994
YAJIMA T 39034
YAMABAYASHI H 39862
YAMADA A 39851
YAMADA T *39100
YAMADA Y 38905
YAMAKAWA K 39589
YAMAKAWA M 39485
YAMAKI N 39401
YAMAMOTO K *39499
YAMAOKA S *39924, *39925
YAMASHITA H 39741
YAMASHITA N *39926

YAMATE G *38925
YAMAZAKI M *39752
YAMAZOE S 39739
YANAGIDA M 39802
YANG W C 39192, 39193, 39194
YANO T *39303
YASUHARA R 39810
YATABE T *39500
YATES W F *39778
YEUNG C K K *39753
YOKOI T *39695
YOKOYAMA F 39270
YOKOYAMA O 39640
YOKOYAMA T 39862, *39877
YONEKAWA E 39842
YONEYAMA T *39970
YORK J L 39763
YOSHIDA A *39833
YOSHIDA H 39580
YOSHIDA K *39101, 39579
YOSHIDA T *39102
YOSHIKAWA S 39627
YOSHIKAWA T *39942
YOSHIMOTO K *39501
YOSHIMURA K 39590
YOSHIOKA N *39455
YOSHIZU H *39103
YOSHIZUMI K 39592
YOUNG C S 39718
YOUNG D R *39718
YOUNG M 39529
YUILL R T *40103
YUKIMACHI K *39304
YUNGHANS R S *40132
YUNOME K 39994
YUSUOKA T *39754

Z

ZAAL P 39122
ZAFONTE L 39661
ZAJONTZ J 38877
ZAKARTCHENKO S 39391
ZALISZ A *39347
ZAWTA B *39569
ZELLNER R *39755
ZENNER B *39104
ZHAROVA A A 39776
ZIMDAHL R L 38961, *39991
ZIMMERMAN J *39613
ZIMMERMAN R D 39129
ZIMMERMANN M 39936
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16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 38847 - 40153.

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